EMERGENCIES
AND
ACCIDENTS
1/-

HAND-BOOK

FOR

EMERGENCIES:

CONTAINING

HINTS AND CAUTIONS TO THOSE ENGAGED IN DANGEROUS OCCUPATIONS, AND TO SUFFERERS BY THE COMMON CASUALTIES OF LIFE.

CASSELL, PETTER, AND GALPIN,
LONDON AND NEW YORK.

1861.

UNIFORM WITH THE PRESENT VOLUME.

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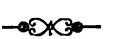
PREFACE.



In offering this little manual to the public, it may be sufficient to state that the object in its compilation has been to compress as much information as possible in a given space. Accidents occurring by fire, by poison, and by the "railway dragon," have been painfully frequent of late, and these are treated of at comparatively greater length. Next in order of gravity may be mentioned—shipwrecks and boat accidents; gunpowder and colliery explosions; steam-boiler explosions; the effects of lightning, and accidents from the falling of buildings, or of building materials. Casualties occasioned by machinery, ordinary burns and scalds, and a long list of miscellaneous accidents also find a place in these pages; but the latter, it hardly need be said, makes no pretensions to completeness. As every day makes known some fresh form of disaster, the greatest good, perhaps, that such a work as the present can do is to inculcate certain habits of precaution, and prepare the reader to act in emergencies with a better intelligence than heretofore. The words of Shakespeare suggest how much we call mischance may be avoided by forethought:—

> "As the unthought, on accident, is guilty
> Of what we wildly do, so we profess
> Ourselves to be the slaves of chance, and flies
> Of every wind that blows."

CONTENTS.

HAND-BOOK OF ACCIDENTS.

ACCIDENTS BY FIRE.

CAUSES OF FIRES.—*To prevent fires, it is necessary to consider what are the principal causes of such calamities.* These were classed by the late Mr. Braidwood under several heads:—

1. Inattention in the use of fires and lights. 2. Improper construction of buildings, &c. 3. Furnaces, or close fires, for heating buildings, or for mechanical purposes. 4. Spontaneous ignition. 5. Incendiarism.

There is little (observed the late Mr. Braidwood, in a valuable report on "Fires" read at the Society of Arts in 1856) to be said on the first head which is not well known to most masters of houses or other establishments; but the difficulty is to keep up their attention, or that of those under them. Some years ago, upwards of £100,000 were lost through the partner of a large concern lighting gas with a piece of paper, which he threw away, and thus set fire to the premises, although it was a strict rule in the place that gas should only be lighted with tapers, which were provided for that purpose. In one department of a great public institution it was, and is still a rule that only covered lights should be carried about, and for that purpose four lanterns were provided. Yet, on inquiry some time back, it was found that only one was entire, the other three being broken—one having lost two sides and the top. Still, they were all used as covered lights.

The opportunities for inattention to fires and lights are so various that it is impossible to notice the whole. *Incautiously approaching window and bed-curtains with a light, and airing linen before the fire, are almost daily causes of fire in London. Children playing with fire* is also another constant cause of fire and frequent loss of life. *The dresses of females taking fire* adds very much to the list of lives lost by fire, if it does not exceed all the other causes put together. *Taking off the burning coals from a fire, and laying them on the hearth*, also occasions fires frequently.

In respect of two late fires, the late Mr. Braidwood drew the attention of the Metropolitan Board of Works to the fact that both were caused *by the hearths being laid upon timber, which took fire.* "Both these buildings," he observed, "have been erected within a few years; and you are well aware that such practices as I have alluded to are directly contrary to all the Building Acts which have been in force for the last seventy or eighty years. Can nothing be done to stop such flagrant violations of the Building Acts? *I have no doubt that many fires, the cause of which are marked in the fire report as 'unknown,' arise from timber under the hearths.*"

The danger from furnaces and close fires, whether for heating, cooking, or manufacturing purposes, is very great, and no flue should be permitted to be so used, unless it is prepared for the purpose.

There is another very common cause of fire—viz., *covering up a fire-place, when not in use, with wood or paper, and canvas*, &c. The soot falls into the fire-place, either from the flue itself, or from an adjoining one which communicates with it. A neighbouring chimney takes fire; a spark falls down the blocked-up flue, sets fire to the soot in the fire-place, which smoulders until the covering is burned through, and thus sets fire to the premises.

Reading in bed by candle light is another source of the same evil. A very serious annual loss is also caused by want of due care in *hanging up or removing the goods in linen-drapers' shop windows when the gas is burning.* Flues taking fire often result in mischief, and it is believed that many serious fires have arisen from this cause, which can hardly be called accidental, as, if flues are properly constructed, kept moderately clean, and fairly used, they cannot take fire.

Habits of intoxication are reported as having occasioned, in 1858, three fatal fires. The total number of these accidents unreported is, however, fearfully large. The number of deaths by fire from the *ignition of wearing apparel* has been truly awful. Females and children, in all ranks of life, have been the victims, and the papers have been filled with suggestions for the prevention of such accidents. Another fertile cause of fire is *the employment of children of tender age to light fires*, with their propensity to play with that dangerous element.

Close Fires with Brick Flues.—The danger arising from the furnace is principally that, from one cause or another, it always cracks, letting out smoke and flame. This result might be considered advantageous, as it tells its own misfortune, perhaps before any serious damage occurs; but it is not always that proper attention is even then paid to it; because, in lieu of the expense of thoroughly repairing the furnace, or of renewing it,

the surface is merely plastered over, to again crack and show its power of mischief. But, should the furnace or cockle be replaced, that the smoke thus escaping can be carried off, the damage will not be perceived until, probably, some woodwork has caught fire, which, in course of time, is the inevitable result. The commencement of the decay of many furnaces has been caused by the carelessness of the person into whose charge the management of the fire has been committed.

The number of deaths arising from the ignition of wearing apparel, bed-curtains, &c., is truly awful. Females and children in all ranks of life are the victims. In one of the daily papers, people were advised, after washing muslins, bed and window-curtains, or children's clothes, to rinse them in water in which *saltpetre* had been dissolved. The "Medical Times," in alluding to the melancholy deaths of the ladies, Laura and Charlotte Bridgman, says:—"The light fabrics manufactured for ladies' dresses must be made blaze-proof. Nothing can be more simple. The most delicate white cambric handkerchief, or fleecy gauze, or the finest lace, may, by simple soaking in a weak solution of chloride of zinc, be so protected from blaze, that if held in the flame of a candle, they may be reduced to tinder without blazing. Dresses so prepared might be burnt by accident, without the other garments worn by a lady being injured. When poor Clara Webster was burnt, at Drury Lane Theatre, in 1844, we inculcated the same moral; and now the dresses of stage dancers are prepared in the way we recommended. Why are dancing ladies of rank to be exposed to danger, from which their dancing sisters by profession are protected?"

Chloride of zinc is well adapted for this purpose, but *alum* answers almost as well, greatly improves the appearance, especially of coloured fabrics, and is oftener at hand.

An invention for rendering incombustible every substance hitherto liable to be consumed by fire has been exhibited by Messrs. Schuessel and Thouret. The inventors say that the material for effecting this will be as cheap as common starch, or that a bale of linen, or cotton, or muslin, one cubic foot square, may be prepared by it at the cost of one penny; that the cloth so prepared will preserve its anti-inflammable qualities until it is again washed, and that mere wear has no effect upon it.

The Safety Match.—In 1859, thirty-two fires were occasioned by the incautious use of lucifer matches,* out of a general total of 1,089. Out of the 1,114 fires, forming the total

* The assistant secretary of one of the largest fire offices in the kingdom broadly informed us that the introduction of the lucifer match caused them an annual loss of ten thousand pounds.—*Quarterly Review*, vol. 96.

of serious conflagrations in 1858, the following proportion was occasioned by the usual contrivances for procuring flame, viz.:—

Children playing with lucifers			12
Lucifer matches accidentally ignited			7
„	„	making	3
„	„	careless use of	17
			39

In the first of these instances, the sacrifice of life and wholesale destruction of property were traced principally to the fact of children inserting lucifer matches into various nooks and crevices, where an accidental concussion had produced their ignition.

The next in the series of casualties are accidents resulting from the sudden ignition of boxes or bundles of phosphorised matches.

The necessity as well as the possibility of removing the fatal cause of these accidents has long been felt. An invention has reached us from across the Channel, and which has already been adopted in most of the large establishments in Paris and other towns of France. This consists of a match which cannot ignite by friction with ordinary substances, but which bursts into flame when struck upon a chemically-prepared substance, owing to the peculiar action occurring between the two bodies which are thus brought into contact. Without the prepared strip, the matches may be struck or trodden upon without the possibility of ignition.

The advantage of having these articles tipped with a material which is not inflammable *per se* is sufficiently obvious, and, we doubt not, will recommend the "safety match," not only to careful housewives, but to the owners of large establishments where the ordinary lucifers are now used.

It is, indeed, extraordinary to see the carelessness with which lucifer matches are thrown about in the kitchen, the parlour, and the office. Both masters and servants have open boxes of these brittle instruments of destruction in improper places, and scatter them in drawers, on counters, and even on the floors. It should be remembered that the nibbling of a mouse, the friction of a shoe, or of a moving door, or of a drawer, or even the shaking, or falling, or crushing of a box containing lucifers, will ignite the matches, and a fire may be the consequence.

The inference is, that lucifer matches are not always used with sufficient care. They should not be given to servants without caution as to their use; they should not be allowed to

lie on shelves, on tables, on floors, or in drawers, and should be kept only in tin boxes.

PLAIN DIRECTIONS FOR AIDING ENDANGERED PERSONS TO ESCAPE FROM BUILDINGS ON FIRE.—The following information, issued by the Royal Society for the Protection of Life from Fire, may be reproduced at the present time, it is thought, with advantage to the metropolitan public:—

The want of presence of mind at the time of an alarm of fire is by far the greatest hindrance to an escape, and for this no regulation can be laid down; but a few simple directions, to be observed by the bystanders and inmates, well considered and reflected upon in time of safety, will, in a great measure, tend to discreet and successful efforts in the hour of danger.

For Bystanders.—1. On an alarm of fire, it should be the object of all persons to direct their efforts to save the inmates, and when the fire occurs near one of the stations of the Royal Society for the Protection of Life from Fire (without waiting to ascertain if there is likely to be danger), see that instant notice is forwarded to the conductor, whose duty it is to proceed to the place of alarm immediately. The society always remunerates* the persons calling and assisting the escapes; should the fire not be in the neighbourhood of any of the society's escapes, ladders and ropes should be sought for.

2. Two well-qualified persons (constables or others) should ascend to the roof through the adjoining houses. It is often the case, that most efficient assistance can from thence be rendered the inmates by an entrance to the upper part of the house on fire, either by the attic windows, the loft door, or by removing the tiles.

3. When the fire occurs in a narrow street or court, assistance can be given most efficiently from the windows of the opposite house, particularly by means of a ladder placed across the street from window to window.

4. When no other means present themselves, the bystanders had better collect bedding at hand. In case the inmates throw themselves from the windows, a blanket or carpet, held stretched out by several persons, will serve the purpose. The society's fire-escape conductors carry jumping-sheets with them for use upon emergency; they are also kept at all the City police-stations, and many of the metropolitan police-stations. Rewards

* For more effectually obtaining the call to fires at the very first alarm, the committee have published the following scale of rewards:—To the person giving the call at a fire-escape station, whereby the conductor is enabled to save life, 5s.; if it enables the conductor to arrive before an engine, 2s. 6d.; if after an engine, 1s. 6d.; to the second and third persons assisting the conductor, each 1s; the persons "calling" to assist the conductor.

are granted by the society to all well-authenticated cases of rescuing life from fire, in whatever way effected.

For Inmates.—1. Every householder should make each person in his house well acquainted with the parts thereof which afford the best means of escape, whether the fire breaks out at the top or at the bottom; and, in securing the street-door and lower windows for the night, care should be taken that an easy outlet for every member of the house is not thus prevented in case of fire. There are many excellent fire-escapes invented for keeping in dwelling-houses, descriptions and drawings of which may be seen upon application at the office of the "Royal Society for the Protection of Life from Fire," 47, Ludgate-hill, where every information on the subject will be afforded.

2. Inmates at the first alarm should endeavour calmly to reflect what means of escape there are in the house; if in bed at the time, wrap themselves in a blanket or bedside carpet, and open neither windows nor doors more than necessary, and shut every door after them. (This is most important to observe.)

3. In the midst of smoke it is comparatively clear towards the ground; consequently, progress through smoke can be made on the hands and knees. A wet silk handkerchief, or worsted stocking, or other flannel substance, drawn over the face, permits free breathing, and excludes, to a great extent, the smoke from the lungs. A wet sponge is alike efficacious.

4. In the event of being unable to escape either by the street-door or roof, the persons in danger should immediately make their way to a front room window, taking care to close the door after them; and those who have the charge of the household should ascertain that every individual is there assembled.

5. All persons thus circumstanced are earnestly entreated not to precipitate themselves from the window while there remains the least probability of assistance; and, even in the last extremity, recourse may generally be had to joining sheets or blankets together, fastening one end round a bed-post or other furniture; this will enable one person to lower all the others separately, and the last may let himself down with comparatively little risk. Select a window over the doorway rather than over the area.

6. Do not give vent to the fire by breaking into a house unnecessarily from without, or, if an inmate, by opening doors or windows; make a point of shutting every door after you as you go through the house. For this purpose, doors inclosing the staircase are very useful.

TREATMENT OF INJURIES.—1. Send for medical aid; let the

sufferer be put to bed as quickly as possible; remove all remains of clothing about the injured parts, cutting with extreme caution, as it is of the first importance to avoid tearing the skin or breaking a blister.

2. As the readiest thing at hand, cover all the injured parts tenderly with clean cotton wool, or what is commonly known a wadding—the cleaner and purer the better (the best for the purpose is kept by druggists); it relieves by excluding the airs Linen rag, soaked in a mixture of equal parts of lime-water and linseed oil, also forms a good dressing.

3. It is better to avoid cold applications. They certainly allay pain; but, unless the cold be maintained, the momentary relief is followed by a considerable aggravation of the suffering. In extensive burns, moreover, cold water freely applied is not unattended by danger.

4. From thirty-six to fifty hours after the injury the blisters will present a milky appearance, and show surrounding inflammation. When this is the case, they may be opened with the point of a large needle: dressing for burns may then be simple wax and oil, spread on lint; but so much depends on circumstances and the state of health of the sufferer, that it is desirable, as soon as possible, to secure medical attendance.

5. To recover a person in a state of insensibility from the effect of smoke, dash cold water in the face, or cold and hot water alternately. Should this fail, turn him on his face, with the arms folded under his forehead. Apply pressure along the back and ribs, and turn the body gradually on the side; then again slowly on the face, repeating the pressure on the back. Persevere with these alternate rolling movements, about sixteen times in a minute, until respiration is restored. A warm bath will now complete the recovery.

Repeated, as of the Greatest Importance.—Immediately on the fire being discovered, secure an alarm being given to the nearest of the Royal Society's Fire Escape Stations, not delaying an instant; do not wait "to see if it is wanted." Life is more valuable than property, and events have too often proved how fatal even a moment's hesitation is in sending for the fire-escape.

The late Mr. Braidwood's Suggestions in Cases of Fire.—On the first discovery of a fire (observed the late Mr. Braidwood, in his valuable paper on "Fires," read at the Society of Arts in 1856), it is of the utmost consequence to shut and keep shut all doors, windows, or other openings. It may often be soberved, after a house has been on fire, that one floor is comparatively untouched, while those above and below are nearly burned out. This arises from the doors on that particular floor having been shut, and the draught directed elsewhere.

If the fire appears at all serious, and there are fire-engines at a reasonable distance, it is best to await their arrival, as many buildings have been lost from opening the doors, and attempting to extinguish fires with inadequate means. If no engines are within reach, it is well to keep a hand-pump. If that is not to be had, the next best thing is to collect as many buckets outside the room on fire as can be obtained, keeping the door shut; then creep into the room on hands and knees (if the heat and smoke are considerable), and throw the water as nearly in the direction of the fire as possible, keeping the door shut while more water is being collected. The police of the metropolis understand shutting up fires so well, that they have, in many instances, kept fires two or three miles distant from the engine-stations shut up till the firemen arrived in time to extinguish them. As regards public buildings, and edifices wherein large numbers of persons are brought together, no words are too strong to be used in condemning the want of means of escape from burning buildings. Hospitals, union workhouses, and other similar structures, should invariably be made incombustible to the greatest possible extent. The Buildings Act wisely provides, with regard to these and other public buildings within its jurisdiction, that the floors of the halls, corridors, passages, stairs, and landings, and all other ways of egress and ingress within the building, to and from all rooms or apartments used for public congregation, and all galleries connected with such room or apartment, must be wholly supported, made, and finished fireproof. This will increase the chance of escape for the inmates.

It has been suggested that in all houses escape from fire should be provided at the roof. Experience, however, shows, that in those cases where narrow wooden staircases are provided, the opening of a trap-door would cause the flames to shoot rapidly upward. The introduction of iron or stone would in a great measure prevent this, provided that care was taken to close the doors of apartments while endeavouring to escape.

Presence of Mind requisite in Case of Fire.—Much may be done by the inmates of houses to help themselves when a house is on fire, in case neither the engine nor the escape should arrive in time to assist them. The late Mr. Braidwood, in his little work on "The Method of Proceeding at Fires," advises his readers to rehearse to themselves his recommendations; otherwise, when the danger comes, they are thrown, according to his experience, into "a state of temporary derangement, and seem to be actuated only by a desire of muscular movement," throwing chairs and tables from the tops of houses that are scarcely on fire, and, to wind up the absurdity

he says, "on one occasion I saw crockery-ware thrown from a window on the third floor."

PRECAUTIONS AGAINST FIRES.—The use of *fire-guards*, as a protection for children, has unfortunately gone much out of fashion. The propensity of children to play with fire, candles, or lucifer matches is reported to have caused twenty-four fires during 1858; but this is not a tenth part of the accidents arising from this fruitful source of mischief.

Prevention of Fires in Chimneys.—The principle of Davy's Safety Lamp has been successfully applied to prevent *fires in chimneys*, by M. Maratueh, in France. He has found, by experiment, that, if fire-frames of ironwork are placed near the base of the chimney, one above the other, about one foot apart, no flame will pass through them, while the draught of the chimney will not be impaired, and, consequently, no fires can happen in the chimney. As most of the soot lodges on the uppermost wire, but little on the second, and none on the third, he suggests that, with a brush applied once a day to the lowest or two lowermost, the chimney will never want sweeping.

To put out a Fire in a Chimney.—When a chimney has caught fire, it is to be put out by stopping the draught of air. By scattering a handful of sulphur over the dullest part of the burning coals, a vapour is sent up the chimney that will not support flame. Having done that, take care the door and windows are all shut; throw water on the fire, and plug up the mouth of the chimney with a piece of old carpet or blanket dipped in water. The object is to prevent, by any means, the passage of air up the chimney; that being done effectually, the fire is choked, and must die out.

Precautions to be taken against a Fire amongst Farming Stock.—The following excellent suggestions are by Mr. Beaumont, the Secretary of the County Fire Office:—

"Forbid your men to use lucifer matches, smoke or light pipes or cigars, destroy wasps' nests, or fire off guns in or near the rick-yard, or to throw hot cinders into or against any wooden out-building on the farm, on pain of instant dismissal. Place your ricks in a single line, and as far distant from each other as you conveniently can. Place hay-ricks and corn-stacks *alternately*; the hay-rick will check the progress of the fire. Keep the rick-yard, and especially the spaces between the stacks and ricks, clear of all loose straw, and in all respects in a neat and clean state. The loose straw is more frequently the means of firing than the stack itself. Have a pond close to the rick-yard, although there may be but a bad supply of water. When a steam thrashing-machine is to be used, place it *on the lee-side* of the stack or barn, so that the wind may blow the

sparks *away from* the stacks. Let the engine be placed as far from the machine as the length of the strap will allow. Have the loose straw continually cleared away from the engine; see that two or three pails of water are kept close to the ash-pan, and that the pan itself is kept constantly full of water."

HOW TO ACT WHEN A FIRE HAS BROKEN OUT IN A RICK-YARD.—Do not wait for the engines, nor for the assistance of the labourers from a distance. Depend entirely upon the immediate and energetic exertions of yourself and your own men. Do not allow the rick or stack on fire to be disturbed—let it burn itself out; but let every exertion be made to press it compactly together, and, as far as is practicable, prevent any lighted particles from flying about.

Get together all your blankets, carpets, sacks, rugs, and other similar articles, soak them thoroughly in water, and place them over and against the adjoining ricks and stacks towards which the wind blows.

Having thus covered the sides of the ricks adjoining that on fire, devote all your attention to the latter. Press it together by every available means. If water is at hand, throw upon it as much as possible.

If engines arrive, let the water be thrown upon the blankets, &c., covering the adjoining stacks, and then upon the stack on fire.

Among the numerous hands who flock to assist on these occasions, many do mischief by their want of knowledge, and especially by opening the fired stack, and scattering the embers. In order to obviate this evil, place your best man in command over the stack on fire, desire him to make it *his sole duty* to prevent it being disturbed, and to keep it pressed and watered.

Place other men, in whose steadiness you have confidence, to watch the adjoining ricks, to keep the coverings over them, and to extinguish any embers flying from the stack on fire. In order to effect this, it is most desirable that there should be ladders at hand to enable one or two of the labourers to mount upon each stack.

If the ricks are separated from each other, and there is no danger of the fire extending to a second, it is of course desirable to save as much of the one on fire as may be possible. That, however, is not unfrequently accomplished by keeping the rick compactly together rather than by opening it.

Send for all the neighbours' blankets and tarpaulins: these are invaluable; they are near at hand, and can be immediately applied.

PRECAUTIONS IN THE USE OF GAS.—"Among the causes of fire," observes Mr. Wm. Baddeley, the eminent engineer, in his "Report of London Fires," "*the great number of accidents arising from the use of gas* is very remarkable, and is a standing disgrace to the science of the age. And not only have these accidents been numerous, but in many cases serious, and in some fatal. A large proportion of these accidents have arisen from the hydraulic joints of gaseliers, and it is greatly to be desired that some efficient substitute for this simple and beautiful contrivance could be hit upon; for, so long as water will evaporate, and people will forget to replenish, mischief will continually arise; and when gas and atmospheric air combine in due proportions, an explosive compound is produced of the most destructive character."

Gas-burners are also Dangerous when placed near a Ceiling.—A remarkable instance of this took place lately, where a gas-burner set fire to a ceiling 28½ inches from it. The late Mr. Braidwood, in allusion to the increase in the number of fires, as well as the serious damage done by them of late years, attributed them to the many improved modes of heating, and the general use of gas, which render spontaneous ignition more common than formerly, and, when premises do take fire, cause the fire to proceed much more rapidly. In 1833, of the number of premises which took fire, barely 21 per cent. (20·9) used gas; while in 1855 gas was used in upwards of 67 per cent. of the buildings which took fire.

Snakes, as the flexible tubes are called, are dangerous, as the pressure of the gas forces liquid caoutchouc out of the india-rubber tubes, which is, of course, equivalent to an escape of gas. Gutta-percha pipes, as sold for the purpose, do not withstand the usual pressure of gas. In fixing gas-lights, Mr. Wyatt Papworth recommends that when they are placed near ceilings or beams of any description, as in the case of low rooms, they should be well protected by sheet iron, and, if possible, a space of at least an inch should be left between it and the woodwork, for air to pass. Timber, after exposure for some time to the action of flame and its heat, becomes so deteriorated as to take fire very easily.

A fertile cause of fire is the use of pipes for conveying away the products of combustion. Every one is acquainted with the danger of stove pipes; but all are not, perhaps, aware that pipes for conveying away the heat and effluvia from gas-burners are also very dangerous when placed near timber. It is not an uncommon practice to convey such pipes between the ceiling and the flooring of the floor above. This is highly dangerous.

Gas Stoves and Heating Apparatus.—"The application of gas for heating purposes," observes Mr. Wyatt Papworth, "is now being rapidly introduced into use in domestic as well as in public buildings. As gas becomes generally reduced in price, so much sooner will it supersede more dangerous inventions. Gas stoves, and all cooking stoves, require a slab of stone or slate, or sheet of iron or lead, between them and the floor; and from the great heat given off by the pipe, almost as much care as in stove pipes is requisite to protect woodwork from its great deteriorating quality. The gas should be turned off at the meter every night, and the meter should be placed where no accident can occur to it, and be fixed firmly. The gas tubes which are commonly used in a dwelling are made of a metal which is melted at a slight heat. If a failure occur, or a fire commences, and the gas be not turned off, it catches light at the fractured or melted portion, and, melting as the gas burns, it greatly adds to the destruction of property, especially when these pipes are placed behind or adjoining to wainscotting, ceilings, hangings, &c. In such places iron tubing ought to be the only material used." Gas stoves require quite as much care as common fires. The heat given out by the gas also increases very much the risk of spontaneous ignition. This is believed to be a very fruitful cause of fires; but, unless the fire is discovered almost at the commencement, it is difficult to ascertain positively that spontaneous ignition has been the cause.

Spontaneous Ignition.—Spontaneous ignition has occasioned nearly twenty fires per annum. Although the fact of spontaneous combustion taking place in cotton, wool, hemp, lamp-black, and many torrified vegetable substances, was tolerably well known at the close of the last century, we are still very much in the dark as to the peculiar laws by which these phenomena are regulated. They form, however, no inconsiderable item in the list of causes of fires. There can be no doubt that many of those that occur at railway stations and buildings are due to the fermentation which arises among *oiled rags*. *Overheating of waste*, which includes shoddy, sawdust, cotton, &c., is a fearful source of conflagrations. The cause of most fires which have arisen from spontaneous combustion is lost in the consequence. Cases now and then occur where the firemen have been able to detect it, as, for instance, at Hibernia Wharf, in 1846. It happened that a porter had swept the sawdust from the floor into a heap, upon which a broken flask of olive oil, that was placed above, dripped its contents. To these elements of combustion the sun added its power, and sixteen hours afterwards the fire broke out. Happily, it was instantly extin-

guished, and the agents that produced it were caught, red-handed, as it were, in the fact. It is an important circumstance to know, however, that oiled sawdust, warmed by the sun, will fire in sixteen hours, as it accounts for a number of conflagrations in saw-mills, which never could be traced to any probable cause.

Spontaneous ignition, according to the late Mr. Braidwood, is generally accelerated by natural or artificial heat. For instance, where substances liable to spontaneous ignition are exposed to the heat of the sun, to furnace flues, heated pipes, or are placed over apartments lighted by gas, the process of ignition proceeds much more rapidly than when in a cooler atmosphere. The greater number of the serious fires which have taken place in railroad stations in and near London have commenced in the paint stores. In a very large fire, in an oil warehouse, a quantity of oil was spilt the day before, and wiped up, the wipings being thrown aside. This was believed to have been the cause of the fire, but direct proof could not be obtained.

Dust-bins, also, very often cause serious accidents. In one instance, £30,000 to £40,000 were lost, apparently, from *hot ashes being thrown into a dust-bin*.

The late fire at Gloucester Cathedral was occasioned, it is believed, from the spontaneous ignition of the rags used by the workmen, saturated with oil and turpentine, having been thrown into a rush basket, and left there. Instances are related of the spontaneous ignition of lucifer matches from the heat of the weather; a cargo of guano taking fire from some salt water finding its way amongst it; sacks of quick-lime burning on being wetted; mixtures of sulphur, iron, and water, acquire sufficient heat to inflame anything near them; masses of vegetable products, placed in a confined spot, ferment or heat until they take fire; fuming acid of nitre, mixed with oil of turpentine, catch fire instantaneously; ignition of buildings by the sun's rays have not been uncommon. Explosions are produced by bruising and moistening with water a few crystals of nitrate of copper, rolled up in tin-foil.

ANALYSIS OF FIRES FROM 1833 TO 1860.—An analysis of the Reports, from the organisation of the Fire Brigade in 1833, to the close of 1860, a period extending over twenty-seven years, affords the following result:—

Year.	Totally Destroyed.	Considerably Damaged.	Slightly Damaged.	Total of Fires.	Alarms.			
					False.	Chimneys	Total.	Total of Fires and Alarms.
1833	31	135	292	458	59	76	134	592
1834	28	116	338	482	57	112	169	651
1835	31	125	315	471	66	106	172	643
1836	33	134	397	564	66	126	192	756
1837	22	122	357	501	82	134	216	717
1838	13	152	383	568	79	108	187	755
1839	17	165	402	584	70	101	171	755
1840	26	204	451	681	84	98	182	863
1841	24	234	438	696	67	92	159	855
1842	24	224	521	769	61	82	143	912
1843	29	231	489	749	79	83	162	911
1844	23	237	502	762	70	94	164	926
1845	23	253	431	707	82	87	168	875
1846	25	233	576	834	119	69	188	1022
1847	27	273	536	836	88	66	154	990
1848	27	269	509	805	120	86	206	1011
1849	28	228	582	838	76	89	165	1003
1850	18	229	621	868	91	79	170	1038
1851	21	255	652	928	115	116	231	1159
1852	25	238	660	923	93	89	182	1105
1853	20	241	639	900	75	87	162	1062
1854	32	307	614	953	79	91	170	1123
1855	36	334	614	984	91	81	172	1156
1856	34	359	564	957	75	72	147	1104
1857	32	439	644	1115	96	91	187	1302
1858	32	385	697	1114	94	112	206	1320
1859	28	393	668	1089	91	102	193	1282
1860	27	395	634	1056	69	116	185	1241
	756	6910	4526	22,192	2194	2644	4937	27,129

CASUALTIES AT SEA.

CAUSES OF ACCIDENTS.—*Collisions.*—Collisions are a fertile source of calamity at sea, and arise, in a great measure, from the hampering of vessels' upper decks with cabins and other constructions, which shut out from the view of the helmsman the object ahead of his ship. It is full time that serious attention should be paid to the subject. The want of a well-understood signal of distress in the cases of collision is also a sad desideratum.

Sir S. Lushington, Judge of the Court of Admiralty, says: —"It is not of British vessels we speak every day, but our ports, especially the port of Liverpool, are so thronged with vessels fom all parts of the world, and especially from the United States of America, that I speak the truth when I say that, within the last two months of my time, one-half has been engaged upon foreign vessels. From the very mouth of the Mersey down to the coast of Ireland, I regret to say, we have had some of the most unfortunate collisions, and the greatest loss of life."*

Statistics of collisions from 1852 to 1859 return a total of 1,714 cases, most of them being of a serious character, and involving the loss of the vessels.

Besides the causes we have mentioned as leading to these disasters, are those from bad look-out, neglect of rule of road, errors in judgment, neglecting to show lights, inevitable accident, &c. The reader may wonder that casualties of this nature should be unpreventable, but in the whole catalogue of disasters at sea, those which present the most terrible features are water-logged timber ships. As a writer in the *Edinburgh Review* states, "The timber trade between Great Britain and her American colonies employs a very considerable fleet of large vessels. As wood is a floating cargo, old, worn-out West Indiamen, which would not be used for any other purpose, are frequently employed. A few years since, in addition to a full cargo, they carried heavy deck loads, which so strained their shattered fabrics, that they often became water-logged, and were sometimes abandoned in the middle of the Atlantic. The sufferings of the crews on these occasions, in their open boats, were appalling. Beating about for weeks on the waste of water without food or drink, beyond the rain that fell from heaven, they were obliged to sustain existence by preying on the bodies of their dead companions, and not rarely they cast lots for the living. Since the passing of the Act prohibiting deck-loading, these disasters are far less frequent; but they have by no means ceased.† At this time there are several timber ships drifting about the ocean, floating heaps of desolation, at the mercy of the Gulf-stream, which will ultimately cast them on some European shore, or drift them into the North Sea, to serve, ultimately, as fuel for the Esquimaux. In turning over the leaves of *Lloyd's List*, we find indications of these dreary wrecks, which, clothed in sea-

* On examining the Wreck Chart, Liverpool will be found to have a formidable row of red marks, which denote collisions some distance off the coast.

† The effect of this Act, which passed in 1839, was most marked. In the three years previous, the average annual loss of timber ships was 56¼, and the loss of life 300. In the three years subsequent to its coming into operation, the loss of ships fell to 23¼, and the loss of life to 106.

weed, are driven over the face of the waters, and sighted by passing ships, of which they often cause the sudden destruction, whilst careering along in seeming security. When these waifs and strays of the deep drift into much-frequented ocean paths, they are doubtless the cause of many of those dreadful catastrophes witnessed only by the eye of God, and our only knowledge of which is a curt notice on the 'Loss-book,' at Lloyds', 'Foundered at sea, date unknown.'"

Spontaneous Combustion.—The recent disastrous fire on board the *Sarah Sands*, while laden with troops, has drawn attention anew to the subject of spontaneous combustion in the holds, coal-bunkers, store-rooms, &c., of ships. It may, therefore, be well to make known the fact that the matter has long been dealt with by Mr. Hay, the Admiralty Chemist, in H. M. Dockyard, Portsmouth. In 1846 that gentleman submitted to the Admiralty a plan, afterwards adopted in the navy, which consisted in inserting iron tubes into the coal-bunkers, in order to afford facility for testing their temperature periodically by lowering thermometers down into them, the results being duly recorded. He, however, found in practice, that the withdrawal of the thermometer from the tube created a current sufficient to reduce the temperature of the thermometer, and thereby cause the record to be somewhat incorrect. In addition to which it is manifest that a small amount of combustion going on in a bunker would hardly be appreciable by the ordinary mercurial thermometer. Impressed by these considerations, Mr. Hay, after mature reflection, perfected an apparatus, which may be thus described:—A thin copper or iron cylinder inverted is employed, of a capacity of from one pint to a gallon, according to the size of the coal-bunker, hold, or store-room, to which it is applied. A small iron tube of a quarter of an inch to half an inch bore is connected with the air-cylinder, and may be led to any distance. It is terminated with an upright glass tube attached to a graduated scale, which may be fixed in any convenient position, such as in the captain's or engineer's cabin, or near the post of the officer on duty; or, when attached to stores or buildings on shore, the thermometer would be fixed outside the door or porch, where it might be inspected by the police, or others on duty. The tube is filled up to the zero on the scale with a solution of soda and water, tinted with litmus, or any other colouring matter, and may be regulated as to the degrees of temperature, like an ordinary thermometer. Two curved or syphon portions of the tube are intended to counterbalance any sudden rise or fall that may be occasioned by the motion of the ship, &c. The principle of the apparatus is easily understood. Air expands with the slightest increment of heat, or increase in its temperature; but a bucket, full of pyrites, or a bale of

cotton, may be in a state of decomposition or slow combustion some time before it produces sufficient heat to be indicated by the mercurial thermometer; whereas the slightest expansion of the air in the metal cylinder of the apparatus above described would show a material rise of the fluid in the glass tube of the indicator. The cylinders may, of course, be protected from accident by strong perforated iron cases. The adaptation of apparatus to purposes like that under consideration is one of the most important advantages which can be derived, and should be adopted in every vessel exposed to the hazards of spontaneous combustion.

One would think that the danger which arises from the close packing of certain substances, particularly those composed of oily matter, and hempen and other textures, was sufficiently understood; the experience of almost every week, however, shows us the contrary. As one instance, amongst numbers: that in the dead of the night, during the voyage of the *Royal Charter* from England to Melbourne, the passengers were aroused by an alarm that the ship was on fire. By the well-directed exertions of the captain and crew the fire was got under, and the lives of the numerous passengers and the fine vessel were saved. On examination, it was found that this danger was caused by a stupid person sending some oil-skin coats, packed in cases, and omitting to mark on the cases what they contained. Lying together, they became heated. In this instance, by the carelessness or ignorance of the packer of these goods, a number of valuable lives and much property were imperilled.

In order to prevent similar accidents, regulations should be made that all dangerous commodities should be distinctly marked, and arrangements made for their proper stowage on ship-board. It would be easy to render parts of vessels fire-proof, and, in miscellaneous cargoes, to separate the goods liable to spontaneous combustion from the others. Might it not also be possible to provide some better means of water-supply than the old-fashioned hand-pumps which are still in use in so many vessels? In steam-ships there should be no difficulty in this, for powerful pumps might be easily contrived, which would be useful either in cases of fire or leakage.

LIGHTNING.—Taking into account every contingency, and the number of ships at sea, the public expenditure on account of damage done to its navy by lightning would, upon a moderate estimate, be from £7,000 to £10,000 a-year upon twenty, three years of the subsequent peace. Besides this great destruction of material, we find in these cases a serious loss of life, or injury to our seamen. Nearly 100 seamen were killed-250 and upwards dangerously hurt, and full 200 struck down on the decks; in some cases 20 to 40 at one time. The *Repulse*,

74, No. 162, lost seven men killed on the spot, and ten more were so disabled as to be of little use to the service after. The *Sultan*, 74, No. 203, had seven men killed at once, and, in the *Thunderer*, 74, No. 219, all the watch in the maintop were paralysed, and had to be lowered down by ropes.

Sir Snow Harris' Lightning Conductors.—On the faith of original researches, Sir Snow Harris was led to discard the prevalent notions relative to the nature and operation of the electrical discharge exhibited in the form of lightning, and at length came to the elementary result (from an immense deduction of facts) that "what we commonly call lightning is an explosive form of action of some unknown natural agency in forcing a path, as it were, through matter the constitution of which is such as to resist its progress, as *e. g.*, atmospheric air, glass, pitch, wood, &c.; while, in falling upon other kinds of matter, such as metals, the constitution of which is such as to oppose but a small resistance to its progress, the explosive form of action termed 'lightning' is no longer apparent, but is converted, as it were, into a sort of comparatively quiescent current, the expansive force of which is always in some direct ratio to the resistance offered to it. The dominant law determining the course of a stroke of lightning is altogether dependent upon this great truth. All kinds of matter are, in respect of any peculiar specific attraction, alike indifferent to electricity; hence the common notion, which considers and covers up every piece of metal as an attraction, and hence a source of destruction, is a vulgar error. On the contrary, smooth metal is the greatest safeguard against lightning, because, as already shown, it offers but little resistance to the course of lightning, or, in other words, it is the most efficient conductor."

Acting on this principle is the system of Sir Snow Harris' Lightning Conductors as now applied in Her Majesty's ships.

Disasters from Currents.—The effect of currents in taking the sailor out of his reckoning is an old, and formerly, perhaps, frequent cause of shipwreck. This source of danger is much obviated by the more intimate knowledge we are acquiring every day of the general laws which produce the currents. One of the most effectual, as well as simple, methods of detecting surface currents, is that known to seamen as the bottle experiment.

Dangers of Icebergs.—An appalling source of maritime disaster in the stormy Atlantic arises from the flow northward, in the summer months, of icebergs. These stupendous masses have their breeding-place in Davis' Strait, from whence they issue in magnificent procession, directly the current increases in a southerly direction. Polar navigators have been surprised to find these huge monsters moving against the wind, apparently by some inherent force, and crashing through vast

fields of ice, as if impatient to escape from the silence and desolation of the Polar Seas. The explanation of this singular occurrence is, that powerful under-currents are acting upon the submerged portions, which, in all cases, preponderate vastly over the glittering precipices of crystal that appear above the water-line. As the icebergs advance into the open waters of the Atlantic, they at last come to the edge of the Gulf-stream, where, about latitude 43°, they harbour in dangerous numbers, and, without doubt, send many a noble ship headlong to the bottom.

Consequences of Compass Defaults. — Many disastrous wrecks can be distinctly traced either to a defective compass, or to an ignorance of the effects upon it of the magnetism of the ship's iron. There is a melancholy example in the loss of the *Apollo*, of 36 guns, in 1803, with 40 sail of merchant ships, out of a convoy of 69 vessels, bound for the West Indies. The *Apollo* was leading the way, with her train of outward-bound sugar ships following in her wake, little suspecting the catastrophe that was to follow. At the very moment that her defective compasses drove her ashore, she imagined that she was some forty miles off the coast of Portugal; and so close was the merchant fleet upon her, that upwards of half of them took the ground and were dashed to pieces. More recently, we have had the instances of the *Reliance* and *Conqueror*, wrecked near Ambleteuse, on the French coast, in sight of the cliffs of Albion, and after voyaging from India. The former is known to have had an immense iron tank on board, the influence of which upon her compasses must have been very great. The *Birkenhead*, wrecked near the Cape of Good Hope, and the ship *Tayleur* in the Irish Channel, are additional instances to which the trembling finger of the magnetic needle points the way, where ignorance or wilfulness have placed impediments to its truthful action. Of the numerous errors that may be classed under the general term of compass defaults, we may mention *defective compasses*, arising from imperfect workmanship, or from an ignorance of the principles of mechanical science; compasses perfectly adjusted, but placed injudiciously either with reference to the magnetism of the ship, or in immediate proximity to concealed and unsuspected portions of that metal. Ignorance of the degree of compass-error arising from the ship's magnetism, and of its varying amount in changes of geographical position, and a consequent belief that, in all places and under all circumstances, the needle is true to the north, are frequent causes of shipwreck.

There can be no doubt that great errors in navigation are induced by inattention in placing the compasses. It is common to see the binnacle within two feet, and even less, of the massive i on-work of the rudder and wheel, which, again, is in imme-

diate contiguity with an iron sternpost. The local deviation is consequently great; magnetic adjustment is had recourse to, and a temporary alleviation of the evil follows, which is only magnified on the ship approaching some distant port.

When the *Agamemnon* adjusted compasses preparatory to sailing upon her unsuccessful expedition to lay the Atlantic cable, it was discovered that the presence of the enormous coil in her hold caused a deviation of no less than 17 degrees!

Defective Ships' Cables and Anchors.—The inefficiency of ships' cables and anchors has occasioned a fearful amount of maritime disaster. In 1852, a Committee, entitled "The Anchor Committee," sat to inquire into the inventions of rival manufacturers, and generally into this most important matter. They reported that, assuming the Admiralty anchor to be the standard, it was the least efficient anchor brought under their notice, saving one, which the Admiralty had not adopted in consequence of the report. Of the other anchors, the best—Trotman's—was 28 per cent. better than the Admiralty one; the worst—Aylen's—was 9 per cent. better. Rodger's anchor stood second on the list, and was put at 26 per cent. better than the Admiralty standard. The only practical result has been that Trotman's anchor has been adopted on board the Queen's yacht, the *Victoria and Albert*.

SHIPWRECKS FROM LIGHTHOUSES.—On a close examination of facts, a singular feature is exposed—viz., that *the great majority of wrecks and collisions occur in the immediate vicinity of the lighthouses intended to guard against the dangers around them.*

There can be no doubt of this very important fact, and it may be readily accounted for by the universal practice of all ships, as far as possible, sailing along the coasts in sight of the lights, taking a fresh course at each point, when the general trend of the coast changes its direction. The numerous chances of error in a ship's reckoning, then, place it in constant peril from the proximity of the dangers it is desired to avoid. Many calamities have demonstrated that a mid-channel course, without very great caution, is a hazardous proceeding, especially to inward-bound ships. These disasters would have been averted had any fixed mark certified the commanders of their exact position and courses. It is, then, to floating structures (says Mr. Findlay, in an admirable report on "Lighthouses," read at the Society of Arts) that we must look to future improvements in pharology. Our light vessels, as at present constructed, are quite incompetent to fill any important station in the system.

Over-crowding of Steamers.—Numerous accidents, attended with a serious loss of life, have occurred through the overcrowding of steamers on rivers. By a provision of the Merchant Shipping Act of 1854, the number of passengers is re-

gulated by law, but contraventions of this Act in this particular are frequent, and should be visited with severe penalties; the sum of £20, and an additional sum, not exceeding five shillings, for every passenger on board over and above the number allowed by the certificate of the Board of Trade, are not sufficiently onerous to prevent these infractions. The cupidity of masters of steam-vessels, in hazarding the safety of their human freight, should, in our opinion, be visited with a more severe sentence, which can alone prevent the dangers arising from over-crowding.

Defective Charts.—Incorrect charts afford an excuse for a master who may have lost his ship, which is but too readily accepted by the members of courts of inquiry and of courts-martial. The defence set up for the wreck of the *Great Britain* steamer in Dundrum Bay, on the east coast of Ireland, was that St. John's light, placed two or three years previously, was not inserted in the most recent charts of the Irish Channel procurable at Liverpool, and that consequently it was mistaken for the light at the Calf of Man. But these two lights are, at least, thirty miles apart, and it is notorious to suppose that a steamer should be so much out of her reckoning within a few hours of her leaving port.

It must, however, be admitted that the charts in common use on board ship are very faulty, both with respect to the position and character of lights, buoys, and beacons, and to the variation of the compass, which is not unfrequently half a point wrong,—an error which may be fatal in shaping a course up channel, or in a narrow sea.

The remedy lies in the hands of the legislature, who have only to compel all chart-sellers to warrant their charts corrected up to the latest date, at least, with respect to lights and buoys.

Negligence of Masters of Vessels.—A want of ability and due precaution by masters of vessels are fertile causes of maritime disaster. The Mercantile Marine Act, however, is doing good service in this respect, and the time is not far distant when the shameful ignorance and neglect of masters of vessels which, within a recent period, have occurred, will be recalled with astonishment that such a state of things could have existed. In the Report on Shipwrecks for 1836, a case is related of the brig *Henry* of Cork, bound to St. John's, New Brunswick, with seventy passengers on board. This vessel was fallen in with by the *Andromeda* of New York, and the passengers and crew were found to be in a starving condition; her master, by his own reckoning, being 800 miles to the westward of his true position!

THE ROYAL HUMANE SOCIETY.—This admirable institution was established in 1774 by Dr. Hawes, Dr. Cogan, and other philanthropic individuals, and has extended its usefulness to a marvellous degree, especially of late years. The Society now enjoys a world-wide reputation.

During the year 1859, 182 cases of rescuing, or attempted rescue, from drowning, were brought under the notice of the Royal Humane Society, comprising 203 persons. Of these, 195 were successfully treated, but eight were unfortunately beyond recovery when taken out of the water. Of this number, 19 were cases of attempted suicide.

During the same year, the Royal Humane Society conferred and distributed to those who were instrumental in saving life from drowning the following rewards:—30 silver medals, 55 bronze medals, 12 thanks of the Society on vellum, 22 thanks on parchment, and 86 pecuniary rewards of various amounts.

The number of people who were estimated to have bathed in the Serpentine river during 1859 was no less than 222,200; and it cannot be surprising that 45 casualties have occurred out of so vast a multitude of bathers; but it is satisfactory to know that, owing to the great exertions of the Society's men, only one case proved fatal.

During the past winter, from the 15th to the 25th of December, the estimated number of skaters and sliders in the parks and Kensington Gardens was 89,100, of whom 69 were rescued by the appliances of the Society. Six of these were saved in Hyde Park and Kensington Gardens, 27 in St. James's Park, and 36 in Regent's Park, without one fatal accident. Seventy-five cases are reported from December, 1860, to June, 1861, of which 68 were treated successfully.

The following table shows the number of deaths and persons rescued from drowning in the Serpentine, both from bathing and suicide, between the years 1846 and 1859 inclusively:—

Year.	Bathers Successfully Treated.	Bathers Drowned.	Cases of Attempted Suicide Successfully Treated.	Suicides Drowned.	Number of Bathers.
1846	42	2	16	5	354,008
1847	24	1	15	2	225,853
1848	18	2	14	4	96,717
1849	27	1	5	5	330,965
1850	13	2	14	6	284,566
1851	24	1	19	8	191,147
1852	25	5	4	9	273,803
1853	21	–	13	2	223,353
1854	13	1	14	3	102,256
1855	20	–	12	7	273,161
1856	27	4	9	7	200,766
1857	13	3	9	10	336,137
1858	21	3	13	3	165,000
1859	45	1	19	–	222,200
	333	26	176	72	3,279,932

To Save Persons in Danger of Drowning.—The following

instructions for saving drowning persons by swimming to their relief are by Mr. Joseph R. Hodgson, of Sunderland:—

1. When you approach a person drowning in the water, assure him, with a loud and firm voice, that he is safe.

2. Before jumping in to save him, divest yourself, as far and as quickly as possible, of all clothes; tear them off, if necessary; but if there is not time, loose, at all events, the foot of your drawers, if they are tied, as, if you do not do so, they fill with water and drag you.

3. On swimming to a person in the sea, if he be struggling, do not seize him then, but keep off for a few seconds, till he gets quiet, which will be after he takes a mouthful or two; for it is sheer madness to take hold of a man when he is struggling in the water, and, if you do, you run a great risk.

4. Then get close to him, and take fast hold of the hair of his head; turn him as quietly as possible on to his back; give him a sudden pull, and this will cause him to float; then throw yourself on your back also, and swim for the shore, both hands having hold of his hair, you on your back, and he also on his, and, of course, his back to your stomach. In this way you will get sooner and safer ashore than by any other means, and you can easily thus swim with two or three persons. One great advantage of this method is, that it enables you to keep your head up, and also to raise the person's head whom you are trying to save. It is of primary importance that you take fast hold of the hair, and throw both the person and yourself on your backs. You can, in this manner, float nearly as long as you please, or until a boat or other help be obtained.

5. I believe there is no such a thing as a death-*grasp;* at least it must be unusual, for I have seen many persons drowned, and never witnessed it. As soon as a drowning man begins to get feeble, and to lose his recollection, he gradually slackens his hold, until he quits it altogether. No apprehension need, therefore, be felt on that head when attempting to rescue a drowning person.

6. After a person has sunk to the bottom, if the water be smooth, the exact position where the body lies may be known by the air-bubbles which will occasionally rise to the surface; allowance, of course, being made for the motion of the water if in a tideway or stream, which will have carried the bubbles out of a perpendicular course in rising to the surface. A body may often be regained from the bottom before too late for recovery, by diving for it in the direction indicated by these bubbles.

THE "MARSHALL HALL" METHOD OF TREATING THE APPARENTLY DROWNED.—1. Treat the patient instantly, on the spot, in the open air, exposing the face and chest to the breeze, except in severe weather.

I.—*To Clear the Throat.*—2. Place the patient gently on

the face, with one wrist under the forehead; all fluids, and the tongue itself, then fall forwards, leaving the entrance into the windpipe free. If there be breathing, wait and watch; if not, or if it fail—

II.—*To Excite Respiration.*—3. Turn the patient well and instantly on his side, and (4) excite the nostrils with snuff, or the throat with a feather, &c., and dash cold water on the face, previously rubbed warm. If there be no success, lose not a moment, but instantly—

III.—*To Imitate Respiration.*—5. Replace the patient on his face, raising and supporting the chest well on a folded coat, or other article of dress. 6. Turn the body over gently on the side, and a little beyond, and then briskly on the face, alternately; repeating these measures, deliberately, efficiently, and perseveringly, fifteen times in the minute, occasionally varying the side; when the patient reposes on the chest this cavity is compressed by the weight of the body, and expiration takes place; when he is turned on the side this pressure is removed, and inspiration occurs.

7. When the prone position is resumed, make equable but efficient pressure, with brisk movement along the back of the chest, removing it immediately before rotation on the side: the first measure augments the expiration, the second commences inspiration. The result is respiration, and, if not too late, life.

IV.—*To Induce Circulation and Warmth.*—8. Meantime, rub the limbs upwards, with firm, grasping pressure, and with energy, using handkerchiefs, &c.; by this measure the blood is propelled along the veins, towards the heart.

9. Let the limbs be thus warmed and dried, and then clothed, the bystanders supplying the requisite garments. 10. Avoid the continuous warm bath, and the position on or inclined to the back.

General Observations of the Royal Humane Society.—On the restoration of life a teaspoonful of warm water should be given, and then, if the power of swallowing be returned, small quantities of warm wine, or weak brandy-and-water, warm; the patient should be kept in bed, and a disposition to sleep encouraged, except in cases of apoplexy, intoxication, or *coup de soleil*. Great care is requisite to maintain the restored vital actions, and, at the same time, to prevent undue excitement.

The treatment recommended by the Society is to be persevered in for three or four hours. It is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance, as cases have come under the notice of the Society of a successful result, even after five hours' perseverance; and it is absurd to suppose that a body must not be meddled with, or removed, without permission of a coroner.

ACCIDENTS BY POISON.

POISONS AND THEIR ANTIDOTES.

CLASS I.—COROSIVE POISONS.—These destroy the texture of the organ or part to which they are applied, and when this organ performs functions necessary for the preservation of the entire animal machine, or is a vital organ, death generally ensues. When a person who is in good health is suddenly seized with violent pain and the sensation of heat in the stomach and bowels, with a drawing together or constriction of mouth and throat, vomitings—particularly of blood—hiccough, fœtor of the breath, convulsions, and either intense heat or a cold clammy moisture of the skin, if no other cause of these symptoms can be assigned, it may be suspected that a poison of this class has been swallowed. In such a case, the nature of the poison being unknown, the most beneficial step to be taken, until professional aid can be procured, is either to empty the stomach by means of the stomach-pump, if it can be procured, or to attempt the evacuation of the poison from the stomach by tepid water or milk, containing in solution white of egg, sugar, and magnesia. Whichsoever of these mixtures is employed, it should be drunk in large quantities; but when the poison is known, the means to be pursued vary, according to its nature.

ANIMAL COROSIVE POISONS.—The blistering-fly *(Cantharis)* is the only animal poison of this class. When it is known that it has been swallowed—which may happen, by mistake, as a medicine—milk solutions of gum or of starch, and similar demulcent fluids, should be drunk freely; the tepid bath used; and clysters of starch, with camphor, administered. Oil would naturally be suggested to the mind as a proper substance for sheathing the stomach in this case, but nothing can be more improper, because oil dissolves the active principle of the blistering-fly, and, consequently, extends its influence. There has been a prevalent mistake as to certain *virtues*, or *vicious* properties, being supposed to reside in the blistering-fly, whence imprudent liberties have been taken with it by foolish people and exhausted debauchees.

There is no *vegetable* substance belonging to the class of corrosive poisons.

MINERAL POISONS.—These are very numerous, but, for our purpose, it is necessary to mention those only which are more likely to be taken by accident.

The acids are—sulphuric, or oil of vitriol; nitric, or aqua fortis; muriatic, or spirit of salt; oxalic, or acid of sugar; phosphoric; hydro-fluoric; tartaric.

The symptoms of poisoning are—an acid, burning taste; severe pain in the throat, stomach, and bowels; frequent vomiting of black matter, and bloody fluid, which effervesces with chalk or alkaline carbonates, and reddens litmus paper; hiccough; tenesmus; great tenderness of the abdomen; difficult breathing; irregular pulse; excessive thirst, drink increasing the pain, and seldom staying down; cold sweats; altered countenance; convulsions; and death.

When either of the three first acids in the list have been swallowed, the lips are shrivelled and discoloured—yellow by nitric acid, and brown by the sulphuric. There are vessications about the mouth, and the internal parts of the fauces.

Treatment.—Mix an ounce of calcined magnesia with a quart of water, and give a wineglassful every two or three minutes. Chalk, or soap and water, may be employed until magnesia can be procured, and, if ever these are not at hand, the scrapings of the walls and ceilings may be used as a substitute. Carbonated alkalies are objectionable, on account of the salt formed with them being too irritating, as well as on account of the great extrication of gas which they occasion in the stomach. Diluents and demulcents are to be taken after the poison is cleared out. Inflammatory and other symptoms to be combated as they appear.

The Sulphate of Zinc is liable, from its frequent use in medicine, to be taken by accident in improper doses. The property, however, which it possesses, of readily exciting vomiting, will prevent, in most cases, any very serious consequences. The symptoms of this poison are—an astringent taste; sense of strangulation; nausea; copious vomiting; frequent stools; pains in the epigastric region, extending afterwards over the whole of the abdomen; difficulty of breathing; frequency of pulse; paleness of countenance; coldness of the extremities.

Treatment.—Vomiting, if not already excited, is to be promoted by administering warm water and emollient drinks. Milk is proper, from its power of decomposing the sulphate. Inflammation must be guarded against, and irritation is to be allayed by anodynes.

Tin, in its metallic state, is not poisonous, but a preparation much used in the arts is highly deleterious, namely—the muriate of tin. There are no cases on record, we believe, of death being produced in the human subject by the use of this substance, but, from a narrative given by Orfila, on the effects of a small quantity taken by accident in food, it is evident that it may prove highly deleterious. Colic was produced in all the individuals, accompanied, in two of them, with diarrhœa.

Treatment.—From the experiments of Orfila, it is evident that milk acts as an antidote to this poison. It is completely

coagulated, and the coagulum contains muriatic acid and oxide of tin, and is not deleterious.

Ammonia, or *Volatile Alkali*.—Many instances have occurred in which liniments, intended for external application, containing large quantities of volatile alkali, have been swallowed by mistake. Vinegar, lemon-juice, or solution of citric acid, should be immediately given, and afterwards milk, mucilages, and other demulcent fluids.

Arsenic.—Of the varieties of death by poison, none are more frequent than those occasioned by the incautious use of arsenic, chiefly on account of the facility with which it is procured. It is, however, fortunate that there are few substances in Nature, and, perhaps, hardly any other poison, whose presence can be detected in such minute quantities, and with so great certainty.

The law (Vict. 14th and 15th, cap. 13) which forbids arsenic to be sold otherwise than coloured, and except with full registration of the sale, and in presence of a witness, known to both buyer and vendor, has probably diminished the accidents arising from the use of that drug.

Arsenic is an artificial production, and is principally prepared in Saxony, from cobalt ores. Whilst the latter in the crude state are roasting for the purpose of obtaining zaffre, the vapours arising from the oxide are condensed in a long and large chamber, and to these potash is added. The mixture is then sublimed, and the white oxide is obtained, leaving potash with sulphur.

The symptoms on taking arsenic are, generally within half an-hour, occasionally even ten minutes, great depression, approaching to fainting, followed by burning pain in the stomach and bowels, with violent vomiting; also heat in the fauces and œsophagus, with a sense of suffocation; pain and constriction felt about the thorax and diaphragm; frequent alvine evacuations, often bloody; feeble, thready pulse; cold, clammy perspirations; lividity of the extremities; towards the close there are convulsions, followed by death.

Treatment.—Administer an emetic of sulphate of zinc; excite and encourage vomiting by large draughts of sugared water, linseed tea, or other emollient fluids. Lime water, or chalk and water, may be drunk freely if the arsenic has been taken in solution. Inflammatory symptoms are to be combated upon general principles, viz., by bleeding, general and local; fomentations; frequent emollient clysters, and other remedies, according to the urgency of the symptoms.

Arsenic in Paper-hangings.—It is not to be supposed that because Scheele's green contains arsenic, all green paper-hangings are necessarily injurious. Greens of almost any shade

can be produced by compounding indigo and yellow; and, when so manufactured, are permanent in colour, are quite free from any injurious quality, and will cost very little more than Scheele's, or other dangerous compounds. But even Scheele's green may be rendered innoxious and may be used with perfect safety, if the paper to which it is applied be glazed with either satin-colour or varnish. The danger arising from the use of this pigment consists in the fact that it is a colour very difficult to combine with size; and, consequently, when used in large quantities in cheap paper-hangings, it usually presents a loose, rough surface, from which particles are apt to fall, if the paper be rubbed; but this evil satin-colour or varnish will at once rectify.

Corrosive Sublimate.—Give large quantities of white of egg, diluted in water. The white of egg decomposes this salt, and reduces it to the state of calomel, which, acting on the bowels, aided by the liquid, is carried off by purging.

Lime.—Cases of poisoning by this substance must be treated in the same manner as those by ammonia.

Muriatic Acid—Spirit of Salt.—That this acid has been employed as a poison may be readily detected by holding an uncorked bottle of hartshorn over the mouth of the phial or cup in which the poison was contained, whether it was in a pure state or mixed with other substances. If the phial or cup contained muriatic acid, copious, dense, white fumes will be immediately perceptible. Administer directly calcined magnesia, mixed in any bland fluid.

Muriate of Antimony—Butter of Antimony.—This substance is employed by farriers as a horse medicine. Administer large draughts of a strong decoction of the yellow Peruvian bark, and, until this can be procured, diluents in quantities sufficient to excite vomiting and to wash out the stomach should be given.

Nitrate of Silver—Lunar Caustic.—This has been sometimes swallowed by mistake by children. Force into the stomach a strong solution of common salt, which forms an insoluble, and consequently innocuous substance, by uniting with the nitrate in the stomach. After this, empty the stomach by an emetic or by the stomach-pump.

Fulminating silver also acts as a violent poison on animals, in small doses. But, if charcoal mixed with water is administered in sufficient quantities, the symptoms speedily cease.

Subnitrate of Bismuth—Flake White.—This substance is employed as a white pigment by artists, and, therefore, may be taken into the stomach by mistake. Administer large draughts of milk, as this liquid is instantaneously curdled by the sub-

nitrate, and involves the poison; thus affording time until professional aid can be obtained.

Nitric Acid—Aquafortis.—Give a strong solution of soap, or a mixture of calcined magnesia in water.

Oxalic Acid.—Many persons have been poisoned by taking this acid in mistake for Epsom salts; but this could never happen if medicines were tasted before being swallowed, the taste of Epsom salts being bitter, and that of oxalic acid sour. On account of the dreadful rapidity with which oxalic acid acts upon the system, remedies cannot be of material use unless they are resorted to immediately after the acid has been swallowed. Emetics may be given if vomiting is not already free; but time should never be lost in administering them, if an antidote is at hand. In particular, it is necessary to avoid giving warm water with a view to accelerate vomiting; for dilution will promote the entrance of the poison into the blood, if it has not the effect of immediately expelling it.

Large doses of magnesia or chalk should be given as speedily as possible, suspended in water. As no time should be lost, the plaster of the apartment should be resorted to, mixed with water, when the other antidotes are not at hand. These substances not only neutralise the acid, so as to take away its corrosive power, but likewise render it insoluble, so as to prevent it from entering the blood.

Solution of Potass.—This solution is colourless, and might be swallowed in mistake for water by a child or an ignorant person. Vinegar or lemon-juice should be immediately administered.

Sulphuric Acid—Oil of Vitriol.—This is one of the strongest of the corrosive poisons. Calcined magnesia, in milk or water, should be given immediately; or a solution of soap, or of any of the fixed alkalies.

Tartaric Acid.—Administer chalk and water.

Tartar Emetic.—As this medicine, when in powder, resembles magnesia, it has been sometimes taken in mistake, in dangerous doses, instead of that remedy. Dilute largely with decoction of yellow Peruvian bark, which decomposes, and renders the tartar emetic inert; or, if this cannot be had, evacuate the poison quickly, by encouraging the vomiting it induces with warm water, and afterwards allay the vomiting with a grain or two of solid opium.

Many persons have suffered intensely from having taken by mistake a dose of tartar emetic, instead of cream of tartar, in making effervescing drinks. It should be well understood that the cream of tartar (a very pleasant refrigerant) is a tartarate of potash, whereas of "tartar emetic," loosely so called, the metal antimony is an essential ingredient.

Verdegris.—It ought to be generally known that pickles, and vegetable and fermentable substances cooked in copper pans, if allowed to stand in the pan after it is taken from the fire, produce a ring of verdegris, by the action of the acid, aided by the air, on the copper with which it is in immediate contact; but if copper vessels be kept fresh, and the food cooked in them be not allowed to remain in them after they are taken from the fire, no danger can result from their use. When poisoning by this means occurs, administer large doses of syrup, or of sugar and water, until the vomiting is produced by the bulk of the liquid, and afterwards give sugar or syrup in more moderate doses.

The preparations of copper, all poisonous to the human body, are:—

Sulphate of copper, or blue vitriol.
Acetate of copper.
Subacetate of copper, or verdegris.
Muriate of copper.
Nitrate of copper.
Ammoniaret of copper.

The symptoms of poisoning by copper, are: an acrid and coppery taste; tongue dried and parched; constriction of the throat; severe vomitings or fruitless attempts to vomit; dragging at the stomach; dreadful colic; frequent bloody stools, with tenesmus; abdomen distended; pulse small, hard, and quick; syncope; great thirst and anxiety; cold sweats, sometimes jaundice; vertigo, cramps, convulsions, and death. A strong solution of sugar and water is a speedy remedy for persons suffering from eating food or condiments containing salts of copper.

White Vitriol.—Administer milk freely; it not only assists in sheathing the stomach against the corrosive quality of the poison, but partially decomposes it, and renders it nearly inert.

Class II.—Acrid Poisons.—These are substances which have a more or less caustic taste, and which, on being applied to the skin, excite inflammation, terminating sometimes in vesication, and at other times in suppuration, and the destruction of the cuticle. When taken into the stomach, they operate nearly in the same manner as the corrosive poisons. The substances arranged in this class belong chiefly to the vegetable kingdom; and this is an important fact; for, knowing that none of the corrosive poisons are vegetables, when the symptoms of poisoning similar to those caused by the corrosive poisons occur, and it is found that these have been excited by a vegetable substance, it may be immediately concluded that it belongs to this class of poisons. If the poison be unknown, first open the stomach by copious draughts of

mucilaginous diluents, or by the stomach-pump; after which vinegar or lemon-juice, or any other weak acid, must be freely administered until professional aid can be procured.

There are no *animal acrid poisons.*

VEGETABLE ACRID POISONS.—These are very numerous, but we will notice those only which are more or less likely to be taken into the stomach either by desire or by mistake.

Bryony Root.—This is a large, fleshy, yellowish-white, spindle-shaped root, with a sweetish, but, at the same time, acrid and bitter taste.

When it is known that bryony root has been swallowed as a poison, excite vomiting by irritating the throat with a finger or a feather, and by administering large draughts of tepid water; after which give milk, with from a grain to two grains of opium, once in two hours, until the violent colic pains are abated.

Coloquintida—Bitter Apple.—Much danger has been often incurred by overdoses of this substance being ordered by empirics and pretenders to specifics, but it has seldom caused death. First evacuate the stomach, in the way already mentioned, and then administer milk and oil.

Gamboge.—This vegetable production, being used as a pigment in water-colour drawings, has often been swallowed in dangerous doses by children, and has produced fatal effects from the violence of the vomiting and purging which it causes. Administer milk, and other demulcent diluents, with a grain of opium at short intervals.

White Hellebore Root.—This root excites violent vomitings and purgings, with bloody evacuations, which soon prove fatal, if proper measures to counteract its influence be not immediately taken.

Evacuate the stomach with copious draughts of demulcent fluids, and sheathe the bowels with clysters of starch, and other emollients; then admininister freely acidulated drinks, coffee and camphor, in doses of from six to ten grains. Professional aid cannot be too early procured when this poison has been taken.

Black and Fetid Hellebore.—The symptoms resemble those caused by bryony root, and require to be treated in the same manner.

Sow Bread—Cyclamen.*—The root of this plant, which is a

* This tuberculous plant has long been used in medicine as a violent purgative, and externally as a resolvent, and a remedy for the ear-ache. It is a curious fact that, while pigs can eat any quantity of the root with impunity, not only the active principle itself, but even the natural juice of the root, acts as a poison on small fish, if mixed in the water in which they are in the proportion of one to three thousand. Four grammes of the juice, injected into the trachæa of a rabbit, causes it to die in ten minutes. Bromine appears to be an antidote to this poison, or, at least, to mitigate its effects considerably.

flattened circular tuber, produces effects similar to those of white hellebore when it is swallowed; and, consequently, cases of poisoning by it require to be treated in the same manner as those by white hellebore.

Œnanthe Crocata—Hemlock Dropwort.—This is an umbelliferous plant, common in rivulets and moist places, and is highly poisonous. From the similarity of this plant to the watercress, it has often occasioned serious mistakes. Lately, at Cork, two soldiers and a sergeant's wife were attacked, after tea, with violent vomitings, and severe pain and swelling of the stomach and bowels, through having eaten of this dangerous plant.

Spurge.—The seed-vessels of this family of plants are what is termed tricoccous, that is, composed of three capsules or distinct cells united back to back on a common footstalk. Those of the species indigenous in Great Britain bear a distinct resemblance to capers, and have been occasionally eaten by the ignorant and children in quantities which have proved fatal.

The symptoms are: great heat in the stomach; vomiting violent purgings, with bloody stools. When poisoning from these seed-vessels, or from the Euphorbia of the shops, occurs, first evacuate the stomach by large draughts of tepid water, and then give repeatedly olive-oil and milk, sheathing the lower bowels with starch clysters.

In the same manner are to be treated cases of poisoning by *arum*, or *cuckoo-pint*, the beautiful red berries of which, as they appear in autumn, sometimes allure children to eat the root; *croton oil*, when overdosed; the *meadow anemone*, the *meadow narcissus*; the different species of *ranunculus*, or *buttercups*; and *aconite*, or *wolfsbane*: but in all these cases, we must again repeat it, the best professional assistance should be procured as soon as possible.

MINERAL ACRID POISONS.—These are few when compared with those belonging to the class of corrosive poisons. We shall only notice one.

Nitre—Saltpetre.—This excellent medicine has occasionally been taken, by mistake, instead of Glauber salts, in doses of an ounce or more. It produces vomiting, purging with bloody stools, excruciating gripings, cold sweats; and, if it do not terminate in death, the future life of the patient is likely to be rendered wretched, and he dies paralytic. The instances of poisoning by nitre demonstrate the propriety, or rather the necessity, of tasting medicines before swallowing them, as it would be very unlikely, under such precautions, to mistake nitre for Glauber salts; the taste of the former being cool, bitterish, and penetrating—that of the latter strongly saline

and nauseous. When nitre has been taken in large doses, dilute freely with milk and bland diluents.

CLASS III.—SEDATIVE AND NARCOTIC POISONS.—The substances comprehended in this class of poisons, when taken into the stomach, or applied to the body in such a manner as to be rapidly absorbed, cause drowsiness, stupor, paralysis or apoplexy, convulsions and death, when the dose is sufficiently large. They belong almost exclusively to the vegetable kingdom.

VEGETABLE, SEDATIVE, AND NARCOTIC POISONS.—*Camphor.*—This excellent medicine has occasionally been swallowed in doses so large as to occasion very violent excitement of the brain and nervous system; such as vertigo, difficult breathing, fainting, cold sweats, convulsions, and, in some instances, death. When it is known or suspected that these symptoms have arisen from the administration of camphor, give wine in moderate quantities, with ten or fifteen drops of laudanum at short intervals, until professional aid be procured, or the symptoms abate.

*Hemlock,** *Conicum Maculatum.*—When this poison has been swallowed, either in the recent state or in the form of extract, or of tincture, so as to produce high delirium, or frenzy, or stupor, dilatation of the pupils and convulsions, which frequently terminate in death, the stomach should be first evacuated by the stomach-pump, if it be at hand, or by a scruple of white vitriol, and acidulous fluids afterwards freely administered.

Henbane.—Poisoning by this plant, either in its recent state or prepared for medical use, must be counteracted in the same manner as a case of poisoning by hemlock.

Laurel Water.—This acts as a direct sedative, and destroys life without convulsions, or any of the other symptoms which those substances, regarded as simple narcotics, produce. It is distinguished by the strong odour of bitter almonds; and, in cases of poisoning by it, whatever steps are taken must be prompt. Brandy, containing in each glass from fifteen to thirty drops of solution of ammonia, or a teaspoonful or two of hartshorn should be administered at short intervals, until the habit is roused, and the influence of the poison is overcome.

Opium.—As this medicine, in all its forms of preparation, is the poison most commonly had recourse to by the suicide, there

* Numerous cases of accidental poisoning from hemlock have been recorded. Recently, at Manchester, a bunch of "parsley" was purchased for a salad by a wire-worker. He partook freely of the vegetable, and died in the course of a few hours, poisoned by hemlock, which had been mistaken for parsley. Occurrences such as these point out the necessity for something like a general diffusion of botanical knowledge.

is reason for suspecting that it has been swallowed when the following symptoms occur:—Drowsiness, followed by delirium, pallidness of countenance, sighing, deep and snorting breathing, cold sweats, and apoplexy. The first object in the treatment of such a case is to dislodge the poison still remaining in the stomach, either by means of the stomach-pump, if that can be procured, or by the administration of an emetic consisting of a scruple of white vitriol, or from five to eight grains of blue vitriol, and by irritating the upper part of the gullet and the throat by the finger introduced into the mouth, or with a feather. If no professional aid can be procured, even after the stomach is emptied, then give, freely, acidulous fluids, with strong coffee and cordials. The subsequent drowsiness should be averted by rousing continually the attention of the patient, by obliging him to walk about, and, when it can be done, by immersing him in a tepid bath.

Prussic Acid.—When this poison is taken in a large dose, death almost instantaneously follows; but when the quantity is more moderate, it produces the same sedative effects as laurel water, and is to be counteracted by the same means.

Stramonium—Thorn Apple.—This acts nearly in the same manner as opium, and requires a similar treatment.

Strong-scented Lettuce.—This produces the same effects as opium, and must be similarly treated.

Tobacco.—The symptoms which lead to the suspicion of poisoning by this substance are—severe nausea, vomiting, and other sensations of drunkenness, great sinking of the strength, cold sweats, and convulsions. If little time has elapsed since swallowing the poison, clear the stomach by two or three grains of tartar emetic; but if some time has passed, administer purgatives, and afterwards acidulous drinks, with brandy, camphor, and other cordials.

Mineral, Sedative, and Narcotic Poisons.—A vast proportion of the gases discovered by modern chemists are inexpirable. Ten, however, are spontaneously generated, and their noxious power must be extremely circumscribed. There are some of these gases, nevertheless, which may be produced under ordinary circumstances, or are occasionally the results and accompaniments of peculiar situations and occupations, and of these none is more deleterious than *carbonic-acid gas.* This substance may be generated in various ways. 1. When a number of persons have remained a long time in an apartment, or any other place where the air is not renewed, they mutually vitiate the air, and produce, by the process of respiration, the poison in question. 2. The fumes of burning charcoal consist principally of this substance and carbonic oxide. This is, unfortunately, a frequent cause of death. Persons, on going to bed,

leave pieces of it burning in their apartments, and in the morning are found lifeless. 3. Carbonic-acid gas is contained in the exhalations from lime-kilns, and cellars where wine, beer, and other liquors are in a state of fermentation. Hence the danger of sleeping near the former, and the necessity of ventilating the latter.

This gas is also frequently generated in wells, marshes, and mines. In the latter, however, a different substance is also generated, called the *fire-damp*, or carburetted-hydrogen gas, which is no less deadly. But the frequency of fatal accidents to persons descending wells is to be ascribed to carbonic acid.

Persons affected by this agent feel a great heaviness or pain in the head, intolerable singing in the ears, a great disposition to sleep, and so great a loss of strength as to be unable to support themselves in the erect posture; difficulty of breathing, and violent palpitation of the heart, followed by a suspension of the respiration and circulation. The senses no longer exercise their functions, and sensibility appears to be extinct.

Class IV.—Acro-Narcotic Poisons.—These are substances that inflame, to a certain degree, the surfaces to which they are applied, and, at the same time, produce the stupefying and sedative effects of the narcotic poisons. They are almost all vegetable productions.

The principal and most common poisons of this class are the following:—

Atropa belladonna, datura stramonium, nicotiana tabacum, digitalis purpurea, cinium maculatum, oil of turpentine, ergot of rye, solium temulentum, æthusa cynapium, cicuta virosa, cusparia ferruginea, laurus camphora, coculus indicus, poisonous mushrooms, æther, alcohol, strychnos nux vomica, strychnos ignatia, &c. &c.

On a review of the poisons included in this class, it appears that great diversity exists, both as to the symptoms and the appearances, on dissection. Thus, some are rapidly absorbed and carried into the circulation; those that experience their effects are in possession of nearly all their intellectual faculties; but the contraction of the muscles is such that the thorax becomes immovable, asphyxia takes place, and death is produced, without the least trace of redness being discovered in the digestive canal. The *upas tieuté*, the *bean of St. Ignatius*, and *nux vomica*, are of this description.

Some, again, produce strong excitement of the brain, to which somnolency and the loss of the intellectual faculties succeed. Inflammation of the digestive canal is rarely discovered. Of this class are *camphor* and *coculus indicus*.

A third class produces excitement and lethargy, accompanied

with a local irritation, more or less intense; and to this class belong *belladonna, tobacco, stramonium*, and *hemlock*.

In the last division are those which instantly destroy life, by acting on the nervous extremities; as the oil of tobacco. The third of these, Orfila remarks, is alone *strictly* entitled to the appellation of *narcotico-acrid*.

VEGETABLE ACRO-NARCOTIC POISONS. — *Cocculus Indicus.* —The symptoms produced by this poison closely resemble those of intoxication. Vomit and purge freely.

Deadly Nightshade—Belladonna.—The beautiful appearance and sweet taste of the berries of the deadly nightshade often allure children to eat them. The symptoms resemble those of intoxication, with high delirium, accompanied by laughter. It also causes such a state of paralysis of the stomach that vomiting can scarcely be excited by the most powerful emetics. Administer vinegar and acidulous drinks, which often enable the emetics to operate, and continue the use of the acids until all the symptoms disappear.

Elaterium.—This is not likely to be used as a poison; but it may be overdosed in the hands of the ignorant. The chief symptoms are violent purging of watery stools, followed by sudden sinkings and nervous debility. Support the strength by cordials and opium in doses of a grain, repeated at short intervals; and exhibit clysters of starch, with from forty to sixty drops of laudanum in each clyster.

Foxglove—Digitalis.—An overdose of this medicine, in any state of preparation, produces sickness, vomiting, vertigo, indistinct vision, cold sweats, delirium, fainting; and may cause death. To counteract these effects, administer brandy and cordials.

Fool's Parsley—Æthusa Cynapium.—This plant is readily distinguished from real parsley by three long linear leaflets, which are pendent on one side of the base of each umbellule, or umbrella-like expansion of the footstalks of the flowers, and which are not present in parsley. When eaten, fool's parsley produces heat of throat, thirst, vomiting, a small frequent pulse, headache, vertigo, and delirium. It must be evacuated from the stomach by large draughts of demulcent fluids, until professional aid be procured.

Funguses and Poisonous Mushrooms.—The general result of these funguses on the animal economy is pain of the stomach, nausea and vomiting, colic and purging, cramp of the lower extremities, with vertigo, delirium, and convulsions. Evacuate the stomach by emetics and purgatives, or by a combination of the two; as, for example, a scruple of powder of ipecacuanha and two ounces of Glauber salts; after which give acidulous drinks with brandy, or a teaspoonful of æther at short inter-

vals; and, lastly, Peruvian bark. Ammonia and hartshorn are hurtful.

It should be borne in mind that all funguses which grow in damp, shady places, which have a porous, moist, dirty surface, a disagreeable aspect, a fœtid odour, a gaudy colour, have soft, open, and bulbous stalks, and which grow very rapidly, and corrupt as quickly, are to be suspected.

A case lately occurred in France, at Portels, in the Gironde, where a woman and two children were killed in a few hours by eating poisonous mushrooms.

Meadow Saffron—Colchicum.—Overdoses of the remedy and its preparation produce violent purging, often with bloody stools, sinking of the pulse, and cold sweats. Evacuate the stomach by copious draughts of demulcent fluids; then give from six to ten grains of ammonia, or a teaspoonful or two teaspoonfuls of hartshorn, in a glass of brandy, at short intervals.

Nux Vomica—Ratsbane.—The symptoms of poisoning by ratsbane are those of inebriety, vertigo, rigidity of the extremities, extreme difficulty of breathing, and suffocation. Evacuate the stomach and bowels, and afterwards dilute freely with acidulous fluids.

The good effects of milk in cases of poisoning by nux vomica have been proved. A domestic, while drunk, swallowed fifteen pills of extract of nux vomica. Half an hour afterwards M. Gorré found him suffering frightful tortures, the face expressing suffering, and the eyes wild; he was unable to utter any articulate sound, but the rigidity of the jaw and of the limbs indicated the nature of the poison. M. Gorré introduced, with difficulty, a finger between the teeth, and excited vomiting, by which some fragments of pills were thrown up. Then, finding a quantity of milk at hand, he made him drink large quantities at short intervals. The stomach, distended beyond measure, relieved itself from time to time, by regurgitation, of the enormous quantities of liquid which it was made to receive; and M. Gorré, finding the serious symptoms disappear, insisted upon a continuance of the same treatment, under which the patient recovered.

MINERAL ACRO-NARCOTIC POISONS.—*White Lead—Carbonate of Lead.*—The effects of this poison are chiefly felt by painters and workers in white lead, who do not wash their hands before eating their meals. It causes obstinate costiveness, and violent colic, with tremors and palsy of the legs and arms. The same symptoms are produced by cyder, wine, and other liquors, into which *sugar of lead and litharge* have been introduced to remove acidity. Until professional aid can be procured, administer an ounce of castor oil, with forty drops of laudanum, and let the patient be put into a warm bath.

CLASS V. — SEPTIC OR PUTRESCENT POISONS. — This class of poisons comprehends those substances which, on being taken into the stomach, or introduced by any means into the system, produce general debility, faintings, and a breaking down or putrescent state of the animal fluids and solids, without much effect on the intellectual faculties. They are almost all of an animal nature.

Venom of Serpents, such as the viper, the rattlesnake, and the cobra de capello.—The symptoms resulting from the bite of all venomous snakes are nearly all the same—pain in the bitten part, extending towards the heart; stupor, cold sweats, pallor and lividity of countenance, and gangrene of the bitten part, are indications of such venomous bites. Put a ligature upon the limb which has been bitten, between the wound and the trunk of the body, and apply a wine-glass, exhausted by burning a little spirit within it, as a cupping-glass over the part; or let the wound be sucked by a person whose lips and tongue are not chapped, until professional aid can be procured. Animal poisons of this kind are innocuous when taken into the stomach, although their action is so powerful, and often fatal, when they are introduced into the habit by a wound or any other method of inoculation. If the lips or the tongue of a person who sucks a poisoned wound be chapped, the system is inoculated in the same manner as if it were inserted by a lancet, or by a bite, under the skin.

The sting of the bee, the humble bee, the wasp, and the hornet, have each occasionally produced dangerous and alarming symptoms. The sting and bites of this tribe are to be treated according to the violence of their effects. There is a species of the first kind, it would appear, whose sting may prove fatal; and cases are related to this effect, and where scarifications, the actual cautery, oil externally and internally, and ammonia, were all tried in vain. Generally, however, emollient anodyne applications to the injured part are sufficient to allay the irritation occasioned by the less noxious, after extracting the sting. In severe cases, volatile alkali is a valuable medicine.

Poisonous Fish.—Numerous cases are on record of the poisonous nature of various species of fish, and particularly in the West Indies. Dr. Burrows has furnished a catalogue of them, which it may be useful to quote :—

Balistes monoceros, old wife; ostracum globellum, smooth bottle-fish; tetrodron sceleratus, tunney; tetrodron ocellatus, blower, or blazer; murœna major, conger eel; coryphœna splendens, dolphin; sparus chrysops, porgee; coracinus fuscus major, grey snapper; perea major of Brown, esox barnacuda; coracinus minor, lyne; perea venenata, rock-fish; perea vene-

nata of Catesby, grooper; scomber maximus, xiphias of Brown, king-fish; scomber thynnus, boneta; some other species of scomber; mormyra of Brown, blue parrot-fish; clupea thryssa, yellow-billed sprat; cancer astacus, sea lobster; cancer runcolus, land crab; mytilis edulis, mussel.

Of all these, the yellow-billed sprat is the most active and dangerous.

In 1846, Sir Wm. Burnett, M.D., communicated a report to the Royal Society of the rapidly fatal consequences ensuing from eating small portions of the liver of a fish known at the Cape by the name of the bladder, or toad fish (*aptodactylus punctatus*), or *tetrodon* of Cuvier. Death ensued in twenty minutes after eating.

In an hour or two, or oftener in a shorter space of time, after eating stale fish, a sense of weight at the stomach comes on, with nausea, vertigo, and head-ache, heat about the head and eyes, colicky pains, and considerable thirst, often an urticarious eruption of the skin, and in some cases death.

Mussels sometimes produce similar effects to the above, and death has occasionally been the consequence to weak females and children. Oysters, crabs, lobsters, mackerel, sprats, may, from a variety of causes, occasion similar sensations.

Some substances are actually poisonous to certain individuals, which, to mankind in general, are unhurtful—nay, even nutritive.

With some people all kinds of red fish, trout, salmon, and even the richer white fish, herring, mackerel, turbot, or halibut, disagree, as it is called—that is, act after the manner of poisons. They produce fainting, sickness, pain of the stomach, and, if they were not speedily evacuated by vomiting, dangerous consequences might ensue. The same is often the case with mushrooms. The esculent mushrooms act on some people nearly in the same way as the poisonous varieties. Bitter almonds, and other vegetable substances that contain hydrocianic acid, sometimes produce stupor, or nettle-rash, in the small quantities used for seasoning food.

Poisoning by Confectionery, Barley Sugar, &c.—Many fatal accidents have occurred from adults, as well as children, eating confectionery ornaments made of deleterious articles, such as preparations of arsenic, &c., used for the colouring of those articles. A man employed in removing the fragments of the Irish Crimean banquet, in Dublin, some few years ago, took some of the ornamental confectionary home, sweet to the taste, white, blue, and green in colour. Eighteen grown persons and children partook of the tempting articles, and all suffered more or less. One child, four years old, died. There is no doubt that Scheele's green was used as the colouring matter.

At Northampton, in 1848, twenty-one persons were poisoned at a public dinner, of whom one died, from eating blanc-mange that had been coloured with emerald green, in which copper was detected.

It is well to mention that the majority of green colours—in fact, all the most beautiful—are preparations of copper, the only mineral that produces this colour. In "Ure's Dictionary" we find, under the head "green paints," a list of seven greens, nearly all of which are different preparations of copper. Scheele's green and Schweinfurth green, the two most beautiful pigments of this hue, are both deadly poisons. The first is composed of oxide of copper and arsenous acid, or white oxide of arsenic. Schweinfurth green, which is a still finer colour, contains the above-named ingredients, but in different proportions, and with acetic acid in addition. With regard to the first, Dr. Ure tells us it was detected a few years before the publication of his work, as the colouring matter of some Parisian *bons-bons*, by the *Conseil de Salubrité*, since which the confectioners were prohibited from using it by the French Government.

With regard to poisoning by barley sugar, M. Chevallier relates an instance of seventeen persons being attacked by severe and dangerous illness from eating barley sugar with which a little cream of tartar had been mixed, as was stated by the confectioner, to increase the transparency of the sweetmeats, though it was found out that tartar emetic had been used.

The fearful poisoning case at Bradford, in which several lives were lost, and much suffering occasioned to many persons, adults and children, will be remembered. A druggist, Hodgson, Goddard his assistant, and Neal a confectioner, were tried for manslaughter, the latter for making and selling lozenges, and the former for selling the arsenic which was mixed with the lozenges.

RAILWAY ACCIDENTS.

Causes of Accidents, and Means of Prevention.—According to the Report of the Select Committee of the House of Commons appointed on the 8th of February, 1858, to inquire into the causes of accidents on railways, and into the possibility of removing any such causes by further legislation, which Report was founded on a large body of evidence given by officers of the Board of Trade, by eminent engineers, and by directors and various other officers of railways, the causes of accidents may be classified under the heads—inattention of servants; defective material, either in the works or the rolling stock; excessive speed. With regard to the latter cause, men of high

intelligence and long experience affirm that they never knew a case where it was the pace that killed. It may be that an unusual speed, with a heavy load, may bring out, at once, the defect in a worn or ill-fitting tire, or a weak axle, or the unfastened joint of a rail, and so lead to a mishap; but in such cases, the unusual speed, though it is the proximate reason, is not the *causa causans;* in other words, the real responsibility rests not on the engine-driver, but with the departments whose duty it is to keep the rolling stock, or the permanent way, in a safe and sound condition. From 40 to 45 miles an hour appears to be the *maximum* at which the trains are now travelling; but whether this, or 50 or 60 miles an hour, is an unsafe pace, it is impossible to say absolutely. That may be a perfectly safe pace—that is to say, a pace attended with no probability of risk—with carriages in proper order, along a good road free from obstructions, which would be far from safe, all things else remaining the same, if the road be crowded with trains, or be in a bad condition.

Liberality of railway management is one of the best safeguards against accidents. Captain Huish mentions the occurrence, some time ago, of two days of fog so intense that a train could not be seen the distance of its own length; and yet in those two days the London and North-Western Company ran 400 trains without diminishing the speed, by the profuse use of fog signals, no doubt with a great increase of expense. On the other hand, where niggardliness prevails, there will occur accidents; hence, of the thirty-five cases of collisive accidents reported on to the Board of Trade in the course of 1857, the majority were cases of collision between passenger trains and goods trains, not between one passenger train and another.

It is of the highest importance that adequate means should be adopted on all railways for securing punctuality—the grand panacea for safety in all railway locomotion. The evidence given before the Parliamentary Committee is urgent for telegraphic communication, not by the old mode of sight signals of green and red lights, &c., but by the incomparably more secure mode of electric telegraph. The Government inspectors all recommend the latter and newer system. The adoption of this method, on the principle on which it is usually worked, of having the whole line, or portion of line, to which it is applied, divided into small lengths and sub-portions, and providing that each length shall be kept absolutely clear for one train only at a time, supplies manifestly an entire guarantee against casualty from collision.*

* The London and North-Western Company have already adopted these precautions along a great part of their line, and are extending it along the whole length.

A matter of grave importance is the frequency of accidents to servants of railway companies, or persons employed on railways. In 1858, railway companies reported to the railway department of the Board of Trade the cases of 131 servants killed and 101 injured during the year. Of these, 17 were killed and 52 injured from causes beyond their own control; 114 were killed and 49 injured owing to their own misconduct, or want of caution. A large proportion of this species of accidents occurs to porters, &c., in shunting trains; and Captain Galton, in his report to the Board, states:—"Accidents of this class have always been very numerous; they arise partly from the recklessness of the men, and partly from the imperfection of the arrangements for connecting the vehicles in trains." Almost necessarily, the men employed on railways are reckless men; for an occupation environed with such perils to life and limb will scarcely be much sought after by other than men of the hardiest character. Experience also shows that the mass of these accidents are attributable to defective management. This, like every other evil, will have, sooner or later, its remedy. Railway companies already experience the costly sacrifice that attends upon neglect and mismanagement. Lord Campbell's Act has roused them to a more careful supervision and a more liberal conduct.

The damages given by juries, during the ten years ending 1860, for injuries resulting from accidents on various railways in the United Kingdom, amounted to £331,000.

With regard to railway accidents generally, the regulations of most companies have now a similarity of principle, modified by the circumstances of each line. These rules are constantly undergoing improvement, and any fresh cause of danger is provided for as it develops itself. In order to prevent, if possible, accidents to trains, the following railway companies have already introduced upon their lines a means of communication between the drivers and guards:—London and North-Western; Great Northern; North-Eastern; North British; Midland; London, Brighton, and South Coast; South-Eastern; London and South-Western, and a few others.

Sir Francis Head on the Comparative Safety of Railway Travelling.—That Death is everywhere—that he levels his shafts at the throne, the bench, and the cottage—that the rich and the poor, the brave and the timid, are alike the victims of his power, no one will be disposed to deny; and it is, perhaps, equally true that, when he is oftenest encountered, he is, generally speaking, the least feared, and that, on the contrary, he is invariably the least dreaded where he is least known. The human mind becomes callous to dangers to which it has long been accustomed, while, on the other hand, it is often over-

sensitive respecting those which are newly born. That these observations are peculiarly applicable to the dangers attendant upon railroad travelling, will appear from the following comparison between it and that to which the public had been hitherto accustomed.

The dangers of travelling by either mode may be divided into four heads, namely, the dangers of the road; the dangers of the carriage; the dangers of the locomotive power; the dangers arising from momentum, or from the weight of the burden multiplied by the velocity with which it is conveyed.

As regards the first of these, we are certainly of opinion that, *cæteris paribus*, a railroad must be less dangerous than a high-road; because it is flat instead of hilly; because a surface of iron is smoother than a surface of even broken stones; because the lip of the rail, which confines the wheels, is an extra security which the common road does not possess; and because wagons, vans, carts, private carriages, and all other vehicles, as well as horses and cattle, belonging to individuals, are rigorously excluded. As regards the second of these dangers, we submit that a railway car must be less dangerous than a stage or mail coach, because its centre of gravity, when empty, is low instead of high; because its passengers sit low instead of high, inside and not outside; because its axles, receiving no jerks, are less liable to break; and, consequently, because altogether it is less liable to overset.

As regards the third of these dangers, we conceive that there can be no doubt whatever that a locomotive engine must be less dangerous than four horses, because it is not liable to run away, tumble down, or shy at strange objects and noises; because it has no vice in it; because it is not, like a horse, retained and guided by numberless straps and buckles, the breaking of any one of which might make it take fright. And lastly, by the opening of a valve, its daring, restless, enterprising spirit can at any moment be turned adrift, leaving nothing behind it but a dull, harmless, empty copper vessel.

It is true that it is possible for the boiler, unlike the horse, to explode; yet, as the safety-valve is the line of least resistance, that accident, with mathematical certainty, can be easily provided against.

With respect to the fourth of these dangers, it must be admitted that both the speed and the weight of a railway train are infinitely greater than the momentum of a mail or stage coach; yet if the latter, in case of serious accident, be sufficient to cause the death of the passengers, it might be suggested that the former can do no more; just as it is practically argued by old soldiers, when they rebuke recruits for dreading artillery, that a musket-ball kills a man as dead as a cannon-shot.

Prevention of Railway Accidents.—A writer in the *Edinburgh Review* has the following pertinent remarks on this subject:—The general safety of railway travelling, considering how slight is the Governmental control over the powerful corporations entitled to make their profits by conveying passengers and goods in the cheapest manner, is most remarkable. This proves that what the railway companies require is not so much control as regulation. A more effective check on carelessness or parsimony, and a closer responsibility, might reduce the number of accidents nearly to zero. In the meantime, we have no hold on companies to prevent them from gambling with the public safety. In other words, though they are pecuniarily responsible for injuries caused by carelessness or defectiveness, and though they know that when any flagrant calamity occurs their line will be for a time deserted, they have it in their power to run risks involving both the lives of the passengers and their own fortunes, in sanguine reliance on the chapter of accidents turning up in their favour.

A general review of many reported railway accidents shows that a code for merely punishing stipendiary officers is not sufficient protection to the public,

Unpunctuality is a frequent cause of accident—an unpunctuality created by imperfect, because parsimonious, organisation. Subordinates, who would act most faithfully under distinct regulations, and have a right to expect them for their guidance, are driven to rely on their own discretion; and, instead of mere obedience to orders, a fund of individual resources seem to be taken for granted, such as one might be thankful for in effective commanders of armies. Those who are best trained in formal duties are sometimes the worst fitted for emerging efforts of presence of mind and forethought. What should be as regular as the motions of a clock becomes an entanglement and confusion of persons and machinery, on the sudden aspect of danger and death. The station-master or pointsman has his instructions for acting on a certain routine of trains; but the routine is not followed; and, instead of acting on his instructions, he has to make, on the instant, a new arrangement, of which he cannot regulate the results, and with which he cannot get his fellow-officers to co-operate.

In one case described by the Railway Commissioners, in their report for 1850, the station-keeper had no clock or watch, but he took his time from the passing of a particular train; and that train being on one occasion unpunctual, put him wrong, and a collision was the consequence.

To the causes of accident already mentioned, we must add badly-framed and insufficient instructions, together with an imperfect supply of the minor machinery for a line, such as

breaks, signals, &c. Among the multiform origins of railway evils, neither last nor least is the practice of permitting rules to be habitually neglected, until some crash reminds the directors and superior officers of their existence.*

Hitherto, we have looked to the position of the passengers only; but they are not the only persons slain or maimed by railway trains. The companies collectively, and individually every company not in desperate circumstances, have a strong pecuniary interest in the safety of passengers; for every fatal accident brings after it a collapse of passenger fares. But even this interest, which has been found insufficient to secure the highest degree of care, is wanting (except as far as Lord Campbell's Act creates it) in the case of the public at large. It is the pecuniary interest of companies to carry their lines through all convenient levels, inhabited or not, leaving it to the public to take care of themselves. Thus we have annually a formidable item of railway accidents in trespassers and other persons, neither passengers nor servants of the company. These represent, in a great measure, victims deliberately offered up to the cheap construction of railways. Level crossings are less costly than bridges or tunnels, and they are sanctioned at so many lives a-year. It would have been a good rule from the commencement, and one of which the cost would have been well repaid to the public, in its sense of security and ease of mind, had all railways been, as it were, hermetically sealed, so as to render trespassing on them next to impossible.

Another vital responsibility on railway companies is a provision for the safety of their own servants. Much of the sacrifice of life in this respect might be avoided by the adoption of precautionary arrangements, at a slight increase of outlay.

Statistics of Railway Accidents.—It appears, from the returns and reports made to the Board of Trade, that the number of accidents which occurred to passenger trains during the last five years were as follows:—In 1856 sixty accidents occurred, by which 7 passengers were killed, and 281 injured, out of 129,315,196 persons who were conveyed during the year. In 1857 there were sixty-two accidents to passenger trains, by which 24 passengers were killed, and 626 injured, out of 138,971,239 persons conveyed. In 1858 forty-nine accidents happened, by which 24 passengers were killed, and 416 injured,

* It is known to every one that some of the great traffic companies are more remarkable for clean bills as to accidents than others of them; showing the same thing, which many other facts go to show, that a very high proportion of the actual accidents are attributable to causes which it is in the power of the management of the lines to put down. The same was reported in 1858, by a French commission, to be the state of things on the lines in that country.

out of 139,141,135 persons conveyed. In 1859 fifty-six accidents happened, by which 4 passengers were killed, and 571 injured, out of 149,757,924 persons conveyed. In 1860 sixty-eight accidents occurred, by which 29 passengers were killed, and 479 injured, out of a number conveyed which may be estimated at about 160,000,000!

The following table will show the nature of the accidents of usual occurrence on railways in the United Kingdom. The period is for the year ending June 30th, 1860:—

Persons Killed or Injured.	To Dec. 31, 1859.		To June 30, 1860.	
	Killed.	Injured.	Killed.	Injured.
Passengers, from causes beyond their own control	4	224	9	133
Ditto, owing to their own misconduct, or want of caution	16	5	2	5
Servants of companies or contractors, from causes beyond their own control	5	17	5	17
Ditto, from their own misconduct, or want of caution	52	15	63	9
Other persons crossing at levels	13	0	11	1
Trespassers, neither passengers nor servants	21	5	26	5
Suicide	3	0	0	0
Miscellaneous	3	0	2	1
Total	117	266	119	166

Of the casualties in the twelve months, 211 were killed, and 316 injured in England; 12 killed, and 93 injured in Scotland; and 13 killed, and 18 injured in Ireland. The length of railway opened was 10,156 miles in June, 1860.

Precautions when Travelling by Railway.—Dr. Lardner gives the following excellent suggestions to railway travellers:—

"1. Never attempt to get into or out of a railway carriage while it is moving, no matter how slowly.

"2. Never sit in any unusual place or posture; *e. g.*, beware of leaning out of carriage windows, or of putting out an arm.

"3. It is an excellent general maxim in railway travelling to remain in your place without going out at all until you arrive at your destination. When this cannot be done, go out as seldom as possible.

"4. Never get out at the wrong side of a railway carriage.

"5. Never pass from one side of the railway to the other, except when it is indispensably necessary to do so, and then not without the utmost precaution.

"6. Express trains, special trains, excursion trains, and all other exceptional trains on railways are to be avoided, being more unsafe than the ordinary and regular trains.

"7. If the train in which you travel meet with an accident by which it is stopped at a part of the line, or at a time where such stoppage is not regular, it is more advisable to quit the carriage than to stay in it; but, in quitting it, remember rules 1, 4, and 5.

"8. Beware of yielding to the sudden impulse to spring from the carriage to recover your hat which has blown off, or a parcel dropped.

"9. When you start on your journey, select, if you can, a carriage at, or as near as possible to, the centre of the train.

"10. Do not attempt to hand an article into a train in motion.

"11. If you travel with your private carriage, do not sit in it on the railway. Take your place, by preference, in one of the regular railway carriages.

"12. Beware of proceeding on a coach road across a railway at a level crossing. Never do so without the express sanction of the gatekeeper.

"13. When you can choose your time, travel by day, rather than by night; and, if not urgently pressed, do not travel in foggy weather."

ACCIDENTS IN COLLIERIES.*

Causes of Accidents.—The accidents that occur in collieries consist chiefly of explosions of fire-damp and suffocation, tumbling down the shafts, struck with falling substances in the shaft, crushed in or at the bottom of shafts, roof falling in the interior of the mine, run over or crushed by corves in the interior of the mine, water bursting into the mine, ropes and chains breaking, boilers bursting, and machinery, and various incidental causes.

The two enemies that the miner has mostly to dread in his underground explorations are carbonic-acid gas and proto-carburetted hydrogen. The former is heavier than air, and acts on persons in the manner of poison. As soon as it enters the atmospheric air by more than eight per cent., there is danger of suffocation. Men stifled by carbonic-acid gas are only recalled to life slowly, and with difficulty; and, besides, they must have remained but a short time after the accident in the suffocating air. Carbonic-acid gas is produced in all mines, by the breathings of the workmen, the combustion of the lights, the explosion of powder, the putrid fermentation of animal and vegetable substances, and even of combustible minerals.

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* From "Our Collieries, and our Colliers," by William Jones, F.S.A.

We find, from statistics, that the number of deaths from explosion of fire-damp in the collieries of England and Scotland during the four years ending 1854 exceeded 1,000, or at the rate of nearly 300 per annum. Since that period, although much has been done to avert accidents of this nature, there are several fearful instances to add to the sinister list. The most terrible of these was the explosion at Lund Hill Colliery, in the neighbourhood of Barnsley, on the 19th of February, 1857, when no less than 150 hapless men and boys lost their lives. The most lamentable carelessness caused this disaster, the workmen, being left without directions or advice, having taken down lighted candles, when the fire-damp exploded with terrific violence. The necessity for certain precautions is obvious, and these may be stated as follows:—That on no account should workmen be allowed to wander about the workings of pits, except on the direct road to their working places, or unless they are accompanied by a deputy overman, or some one in authority; and that this rule should not be relaxed under any circumstances. It also points to the propriety of danger-signals being fixed at the entrance, not only to places where fire-damp is actually known to exist, but even to places where there is reason to apprehend that it may be discharged and accumulated.

Accessible places having fire-damp accumulated in them ought not to be allowed to remain in that state, but should be ventilated, whether they are working places or not. A competent officer should be at all times in a mine, whenever workmen are employed there, whether by day or night, and whether the persons employed are few or many in number. Explosions from fire-damp show the necessity of persons in charge of pits being certain that they perfectly comprehend and strictly adhere to the orders and instructions of their superiors, except when unforeseen circumstances or conditions arise, rendering it dangerous to do so. Working-places in mines should always be examined with the safety-lamp in the first instance, at least in all mines where fire-damp has once been observed, *and, on no account, should a candle be carried by deputy overmen and others beyond the innermost boling, while they are making such examination.* The discharge of fire-damp is very uncertain, and the necessity of keeping the safety-lamps *locked* is imperative. Numerous explosions have arisen from the carelessness of the miners, in taking the top off their lamps. These lamps should be locked in a manner difficult to open, either on Watson's plan, or with a padlock. The locks of the safety-lamp now in use are almost worthless, and are easily opened by the colliers. Smoking, except in appointed places, should be strictly prohibited. Adequate means, such as stoppings, working in panels, ., are not adopted to prevent a repetition of the destruction

of life, which has been caused by fire-damp. More extra doors are required for the same object.

"Loss of life," says Mr. Blackwood, "from explosions of fire-damp may be divided into two classes: first, death caused directly, by scorching, and the violence of the explosion; and, secondly, death by suffocation from choke-damp. The result of some of these explosions is most disastrous; when ignited at any point, the flame instantly spreads itself throughout the workings in the neighbourhood, and that portion of the mine becomes a mass of living fire. So intense is the heat produced, that the timber is generally all destroyed, and sometimes the pillars of coal are found to be charred to the depth of several inches. The dross, rubbish, and small particles of coal, produced from the workings, become ignited, and the enormous expansion of the air from such a high temperature drives everything before it; doors, brattices, props, loose masses of coal, together with any unfortunate miners that may be within its influence, are carried out with irresistible force through the air-course, or drawing-roads, towards the shaft, the only outlet where explosion can expend itself. The carbonic-acid gas, or choke-damp, which is produced in great volume from the previous combustion, is drawn back again into the mine, to fill up the vacuum caused by the expansion, and envelops the miners, so that those who escape the violence of a scorching fire perish from suffocation; as, in almost every case, when only one shaft is sunk, the brattice is destroyed, and any attempt to restore ventilation in time to save the men is rendered hopeless. This is, perhaps, one of the strongest arguments in favour of double shafts, now so common in the north of England. The wooden brattices in a single shaft, being constantly getting out of order, from moisture, and its proximity to the furnace, never, even when in the best condition, perfectly isolates the one shaft from the other; neither can it ever be so air-tight as when two distinct shafts are used, where the mass of earth betwixt them becomes a natural brattice, and, also, when an explosion does occur, is of sufficient strength to withstand the shock, so that the ventilation can be restored in a comparatively short time, and the means of raising the miners to the surface still remain available."

The greatest loss of life in collieries is occasioned by *falls of roof*. During eight years, from 1851 to 1858, 2,971 deaths have arisen from this accident, making, on the average, 371 lives per annum; and nearly 1,000 more fatal cases than those caused by explosion during the same period of time. The ordinary and universal mode of working the coal was by manual labour at the commencement of the present century, and this practice remains to the present time. Attempts have been

made during the last fifty years to substitute mechanical power. The late Mr. George Stephenson proposed a plan, and had a machine made for that purpose, but, like all similar attempts, when put into practice it proved to be much more expensive than manual labour, and was consequently abandoned.

The "hewers" of coal in a colliery are exposed to great danger, besides, too frequently, the consequences of working in a bent or constrained position; for, in very thin seams, the miner can only perform his work in a kneeling position, or sitting, bending double, lying on one side, or on the back. The larger pieces of coal are pushed out by the "fillers," and carried away to fill the corves, skips, or carriages in which they are removed. There are coal mines in Yorkshire, and near Bristol, also in many other parts of England, where the whole thickness of ground taken out for the man to work in is fifteen inches. In this height the hewer has to work with his pick, in "holing" under the coal—the technical expression for picking out a thin wedge of ground from under the seam, so that the coal, by its own weight, or by driving wedges into the upper part, will become detached.

Accidents from falls of roof principally occur in mines newly commenced, from working out too wide, or from slips and glassy facings which even the most practised eye may fail to detect in the most careful examination. In all seams of this nature there should be "settings" (two trees with a bar quite across the place), being substituted for single "trees with lids," over which the stone may easily break, especially at the ends of the gate roads and stalls, where the area of unsupported roof is considerable.

In working old, thick coal ribs and pillars where the crush or bump comes on, no timber would be of any avail; the workmen should retire upon the first premonitory symptom.

A very great proportion of accidents from falls of coal occur from actual wilfulness of the sufferers themselves—the duty of securing the working place being thrown upon the men themselves, who, even after being warned, still continue to work in danger rather than spend a few minutes to make themselves safe. Instances of this sort have so frequently occurred, that the inspectors have felt it necessary to point out to the officers of the mine that they must not be content with the warning to the men, but see that the place is made secure; or in case of the man's refusal to comply with orders, prevent him from proceeding to work, and use the proper legal remedy under the Mine Inspection Act.

The getting of the old ribs and pillars is peculiarly dangerous; the whole weight of the superincumbent strata having crushed these very much, the coal sometimes comes away with

a rush, bringing many tons down at a time. Before the first fall or rush of the coal some premonitory symptoms are generally given, which, if attended to, enable the workers to escape; but after this, when the loaders have filled up a considerable portion, a second rush takes place, and too often with fatal results. No precautions, except great care on the part of the workers themselves, will prevent these occurrences in getting the old ribs and pillars.

The necessity cannot be too strongly urged of working the thick coal in *two* or even *three* workings, by driving out and bringing back by long wall; the loss of life would be greatly diminished, and the proprietors greatly benefited by obtaining a much larger percentage of lump coal. In a few collieries this system has been tried, and with admirable results.

Accidents from falls of coal and roof will, however, continue to take place under the best management. Many of the roofs are much intersected by "types," and not unusually a thin skin or coating of shale, showing a continuous unbroken stratum, intervenes between the coal and the roof, by which these "types" are entirely hid; and it frequently happens that the poor collier, though wary and vigilant, is unexpectedly overtaken, and instantaneously crushed to death or mutilated for life. It has been urged that if a class of men were appointed to look after the roof, and set up wood throughout the entire colliery, such an arrangement would add to the safety of the workmen employed in it.

In the north of England accidents from falls of roof and coal are frequent and fatal. Here the men engage to secure the roof in their working places; by the working places is meant the part where the coal is worked and filled into hutches, defined in the special rules, twelve feet back from the face of the coal in "long wall," and fifteen feet in "stoop and room" working. Under this system the workmen are quite alive to their own responsibility, and, as many accidents can be prevented by prompt action, either by setting up wood or otherwise, when danger is suspected, it is doubtful if any system of management which has a tendency to lull the colliers into a feeling of fancied security because the master undertakes to look after and secure the roof in their working places, would tend to diminish this class of fearful accidents, which, unfortunately, throughout the coal-mines of Great Britain, form a proportion of more than a third of the whole.

Of all accidents in mines these are the most calculated to convey an impression of the hazardous nature of the employment of underground workmen.

The inspector for South Durham suggests to the owners and viewers of mines, where deputy over-men are employed,

the adoption of a special rule, requiring every deputy to visit, examine, and securely timber the working place of each person under his care, at intervals of not more than four hours.

There should also be an exercise of greater caution while withdrawing timber from abandoned places, particularly in the broken mine. The occupation of drawing timber out of "broken juds" is of a highly dangerous character, even under favourable circumstances, but the risk incurred is often needlessly enhanced by deputies neglecting to "prop their way out," so as to secure their safe retreat in the event of a sudden or unexpected fall of the roof, and by their endeavours to remove a larger portion of the timber than is at all consistent with their personal safety.

Accidents in shafts are divisible into three different classes:—1st. Falling of substances down the shaft when men are descending or ascending. This might be greatly guarded against by the use of a cover or bonnet of sheet-iron attached to the tackle skip, on which the men ascend and descend; the crushed state of many shafts from former workings being a productive source of danger.

2nd. From breaking of chains. The use of single-link chain should be entirely prohibited, and in reference to other sorts of chain, it is now so undoubtedly ascertained that the nature of the iron becomes changed at the points of connection or concussion, from a fibrous to a crystalline state, by long use, without exhibiting any outward appearance of insufficiency, that any sudden jerk or strain will then almost to a certainty cause a fracture at these places, especially if it be borne in mind that in a shaft 100 yards deep there will be of chain and log or dolly alone a dead weight of upwards of one ton. The adaptation of more modern material and machinery would, undoubtedly, greatly add to the security against these accidents, as well as enable the engine to do more duty.

3rd. Falling into shafts. The most fruitful source of these accidents is the want of protection to the banksmen in pushing the runner or wagon over the shaft on which to land the skip, or in withdrawing it and steadying the skip going down; the slightest slip of the foot must almost inevitably precipitate him into the shaft. The adoption of cages and guides with the lifting-gates or wickets would render such accidents almost impossible, as the shaft would never be one moment unguarded.

The number of fatal accidents in shafts during a period of eight years (from 1851 to 1858) amounted to 1,734, averaging 217 deaths per annum. There is an increase of no less than 22 per cent. in the number of lives lost from mining accidents in 1860 as compared with 1859. The quantity of coal raised in 1860 is estimated at 72,000,000 tons; and the proportion of

deaths was, from explosions by fire-damp, 1 to each 198,347 tons raised; from falls in mines, 1 to each 185,567 tons; from accidents in shafts, 1 to each 395,604 tons; from miscellaneous accidents underground, 1 for each 590,164 tons; and from accidents at surface, 1 for each 1,833,333 tons. The average number of lives lost for each million tons of coal raised was 15·5 in 1859, and 15·4 in 1860, the extraction of coal having rather more than kept pace with the increased sacrifice of life. It should be added that the number of accidents diminished 5 per cent., but those which did occur were of a more fatal character.

Bratticed shafts are extremely dangerous, and ought never to be made or used, and no competent engineer, except in places surrounded by great and almost insurmountable difficulties, now adopts them. Where the ropes are made of iron wire, the drums on which they coil and the pulleys over which they pass should be larger in diameter, and provided with deep flanges. Where round ropes are used, each drum should represent the frustrum of a cone, with a spiral groove on the outer surface, in which the rope can rest. The shafts should be made of well-hammered iron, accurately laid on pedestals, with brass steps bored and properly fitted, and, in order to guard against the effects of crystallisations, they should be examined periodically.

Accidents from *overwinding* are unhappily very frequent, and demand the application of some sound system of prevention. In most instances inattention to certain duties which are essential to the safety of the workman is the cause. This was the case in the appalling tragedy which occurred lately at Lord Granville's collieries at Hanley, in the Staffordshire Potteries, by which ten lives were sacrificed, and others were placed in jeopardy. Although this accident is of recent occurrence, it may be useful to relate the leading circumstances of the disaster:—The depth of the principal shaft was 507 yards, and the winding engine raised a load of coals up this distance in a single minute. In raising men, however, twice the period of time was occupied; but even at this reduced speed the cage would be carried from the mouth of the shaft to the pulley in less than ten seconds. This fact shows how intense should be the vigilance of the man at the engine. As it was, he possessed peculiar facilities to guide him in his work. After receiving the signal from the hooker-on at the bottom of the shaft, from which he learned that the cage which he was raising was freighted with human life, his eye should be at once fixed at the indicator, from which he could see at a glance the position of the cage in the shaft, and when it has reached such a position that two strokes of the engine would bring it to the surface, a bell is struck, still further to call his attention. With a view still more certainly to avoid the possibility of any acci-

dent from the possible derangement of the indicator, it was fixed in duplicate. The engine and the whole apparatus was admirable. It appeared from the result of the trial of Gallow, the engine-man, that two men went into the engine-house through a window, by means of which the engine-tender can see the shaft; that one of them spoke either to Gallow or to the other man, asking if they were in Gallow's way; that the latter leaned forward to catch what was said, and in so doing allowed the moment to pass for stopping the engine, which, however, he stopped in not less than a second afterwards, as the case actually balanced on the top of the pulley, and there was no strain upon the rope when it fell. Gallow was committed for manslaughter, but admitted to bail, and the jury expressed their opinion, that but for Tellit and Williams, the two men who entered the engine-house for the purpose of taking an account of time, violating one of the special rules in doing so, this fearful accident would not have occurred.

It is, however, evident that, despite all precautions, the process of lowering and raising men in so deep a shaft and at so great a velocity must always involve the risk of overwinding, and hence of human life. Wonderfully, indeed, must that attention be concentrated which, in the constant performance of such an operation, is never diverted or relaxed; for a single second's neglect involves almost certain death to those being raised. All contrivances to prevent the possibility of overdrawing must fall short of the necessity of the case, and a provision to ensure safety in case the motion of the engine is not arrested at the right moment is absolutely necessary to render safe the working of any collieries, much more of deep mines, like the one in question. Amongst the various inventions which have had this object in view, one patented by Mr. Samuel Bailey appears well suited to the purposes, meeting the two means of ensuring safety from overwinding, namely, that the cage-rope shall be detached from the winding-rope before the former reaches the pulley; and, secondly, that the cage shall be supported from falling down the shaft, or even upon the platform which may be placed over it. The invention is remarkably ingenious, and works admirably. It does not require delicate construction, as the force applied to it when it acts is the whole power of the winding engine.

Hitherto in mine-winding machinery the break wheel or pulley has been stopped by applying pressure on the periphery. Mr. Libotte proposes to act on the wheel by applying pressure or friction against its sides or lateral surfaces. In the preferred arrangement this pressure is exerted by bars moved by jointed links connected to the piston-rod of a steam-engine. These bars have projections on their inner surfaces, which take

into recesses in the wheel when brought up against it, and thus lateral friction or pressure is obtained. The grips by which the cage is prevented from falling in cases of accident are so connected to the suspending rope, or chain, that whilst the rope is perfect the cage can ascend and descend as easily as if no safety apparatus were attached; immediately, however, the rope breaks, the grips are brought into play, and the further descent of the cage is arrested.

About one-sixth of the deaths in coal-mines, or 166 a-year, are caused by *miscellaneous accidents*, the chief of which are crushing by coal tubs, or by passing trains. In the South Durham district, more particularly, the deaths resulting from crushes by tubs or trains bear a much higher proportion to the number of deaths resulting from all kinds of mining accidents in any other district in Great Britain. In fact, during 1858 they embraced upwards of 24 per cent. of the deaths resulting from all the mining accidents of the district, while in the whole of Great Britain during the same year they amount to less than 8 per cent. of the deaths arising from the whole of the accidents in coal mines. The causes of these casualties being so excessive in the South Durham district, are to be found in the great number of trains of tubs drawn at high speed on underground railways by engines, and in the employment of small Shetland ponies in the low and contracted galleries forming the extreme working parts of the mines. The fatal accidents arising from this source were very much fewer in number when horses were employed to do the work which is now done by the engines, and strong lads to do that which is now done by ponies, often driven by very young boys; and, although it can scarcely be expected that the present more economical systems should be abandoned, to return to the former more expensive methods, it is surely not too much to hope that no moderate expenditure will be spared, and no reasonable precautions neglected, that may hold out a prospect of reducing the number of a class of accidents which cause nearly one-fourth of the entire fatality arising from the accidents in the coal mines of the district.

Above-ground accidents may be classed thus:—By machinery connected with small-coal apparatus, by other machinery, by surface wagons on the railway branches near the tops of pits, falling from surface erections, injured by cage at top of pit. The suggestions offered for the remedy of casualties from the above causes are with regard to machinery connected with small-coal apparatus; the propriety may be questioned of employing very young children (as seems to be generally the case) where heavy machinery is in motion. Accidents of this nature might have been prevented, by attention to a rule pro-

hibiting the oiling and otherwise interfering with machinery in motion. A necessity is shown of securely fencing all gangways, breast-walls, or other erections along which persons have to pass in performance of their duties near the top of pits.

We have thus briefly alluded to the fearful casualties which spread death and disaster among the mining population. It is a picture that may well make us shudder for those who spend the best years of their existence in occupations so cheerless and precarious.

ACCIDENTS BY LIGHTNING.

EFFECTS OF LIGHTNING.—Arago, in his "Meteorological Essays," quotes a passage from the celebrated Duhamel de Moveau, who says that lightning, unaccompanied by thunder, wind, or rain, has the property of breaking oat-stalks. The farmers are acquainted with this fact, and have a saying to the same effect.

In thunder-weather the barking of oak-trees is said to be effected with less difficulty than when the day is fine, the wind in the north, and the sky clear.

The hypothesis entertained on the subject of bodies shattered by lightning is, that lightning, by its action, develops in the substances which it traverses an eminently elastic fluid, the tension of which must inevitably act in all directions. Would it be a very hazardous supposition if we were to assume the elastic fluid in question to be no other than the vapour of water?—*i.e.*, that the tension we have spoken of is the force of steam. Suppose humidity in the fissures or small cavities of a block of freestone, and, if struck by lightning, the steam developed will shatter the stone to pieces, and the fragments will be projected to a distance in every direction.

The effects of lightning are singular. In the summer of 1774, lightning struck two persons who were under a tree; portions of their hair were thrown to the top of the tree.

A workman was struck in a tavern; portions of his hat were found encrusted in the ceiling. When lightning falls on men or animals ranged either in a straight line or in an open curve, it is at the two extremities that its effects are, generally speaking, most intense and disastrous. This has been exemplified when lightning struck a stable in which were ranged thirty-two horses, when the two outside horses were killed.

During a violent thunderstorm in the neighbourhood of Constantina, in Algeria, in 1859, the lightning struck one of the posts of the electric telegraph line to Setif, and broke it to pieces; after which it ran along the wires to the office at Con-

stantina, and there, for the space of several minutes, produced an extraordinary effect—detonations following each other, and flashes of electricity going round the room, upsetting tables and chairs, and throwing the apparatus into great confusion. Five persons were in the office at the time, and it was thought wonderful that they were not killed or injured. A fire was caused by the electric fluid, but promptly extinguished. It was not until half an hour after the commencement of this singular scene that the office could be entered with safety.

Arago's Observations on Lightning.—There are three kinds of lightning, observes M. Arago—forked, sheet, and spherical. Forked lightning comes in very slender flashes, generally white, but is sometimes blue or violet coloured. Fine as these flashes are, they often divide into three or more branches; as when, in 1718, twenty-four churches were struck in the environs of St. Pol de Léon, but only three peals of thunder were heard. The flashes of forked lightning are most destructive. They are nowhere seen to more terrible perfection than when lighting up the dark ravines and black precipices of a mountainous district.

Sheet lightning is comparatively harmless. Some of those thunderless summer lightnings are distant sheet lightnings, too distant to allow of the thunder, which yet exists, being heard. Dark red, blue, or violet, are the principal colours of this form of electricity, which has neither the whiteness nor the swiftness of the forked.

Spherical lightnings are what are called, vulgarly, thunderbolts; luminous masses, or fiery globes, which descend slowly to the earth, and make lightning conductors useless. On the night of April 14, 1718, Deslandes saw three globes of fire fall on the church of Couesnon, near Brest, and destroy it utterly; and July 3, 1725, during the height of a thunder-tempest, an enormous globe of fire fell, and killed a shepherd and five sheep.

Summer lightnings have been taken by some to mean essentially harmless interchanges of electricity; but it will sometimes be found, during their appearance, that there has been a storm somewhere on earth, where, what was but lambent summer lightning to the far-off spectator has proved to be deadly destructive fire to some hapless dweller underneath. In a July night of 1783, De Saussure, at the Hôpital de Grimsel, under a calm, clear sky, saw, in the direction of Geneva, a thick band of clouds which gave out thunderless lightnings. This was but summer lightning to him, but the Genevese were suffering all the horrors and ravages of a storm such as the oldest inhabitant had never witnessed. And in 1813, Howard, at Tottenham, saw, on the south-east horizon, and under a clear, starry sky, some pale, summer-lightnings, which proved afterwards to be a violent

storm raging between Calais and Dunkerque. A storm is more dangerous, the nearer it is. Also, the higher the body, the more likely it is to be struck; as, for instance, all mountains, trees, high buildings, and, in the midst of a plain, men and animals, trees, bushes, and buildings, are peculiarly lightning-conductors, and specially liable to be struck. For this reason it is wise to avoid the neighbourhood of trees during a storm.

Thunderbolts have especial attraction to certain places as well as to certain objects. No one in New Granada, says M. Arago, willingly inhabits El Sitio de Tumba Barreto, near the gold mine of the Vega de Supia, because of the frequency of thunderbolts there. Even while M. Boussingault was crossing El Sitio, the black who guided him was struck by lightning.

Chemical, mechanical, and physical effects follow on electrical phenomena, which any one may see repeated on a minute scale by an electrical machine. Lightning melts and vitrifies masses of rock. Watch-springs, small chains, points, and parts of swords and daggers, fine lines or threads of metal, or thin layers and washes, these have been known to have been thoroughly melted by a lightning stroke. Arago relates that a lady was putting out her hand to close a window, during a thunder-storm; the lightning darted, and a gold bracelet which she wore disappeared altogether, so that no vestige of it was found; she herself received only some slight hurts.

Lightning Conductors.—"All other circumstances being equal, lightning directs itself, generally speaking, to the most elevated portion of edifices.

"All other circumstances being equal, lightning directs itself, by preference, to metals. When, therefore, a metallic mass occupies the most elevated point of a house, we may feel pretty nearly certain that lightning, if it falls, will strike that point.

"Lightning which has entered a metallic mass does mischief to the surrounding masses at the moment when it quits the metal, and at the vicinity of the point or points at which it issues from it.

"A house, therefore, may be rendered safe, from its highest point to its foundation, if the metallic parts of the roof are prolonged without interruption to the ground.

"When there are upon the roof or summit of an edifice several distinct metallic masses completely separated from each other, it is difficult, and even impossible, to say which of them will be struck by preference. The only safe practice is to unite all these various metallic masses by rods of iron or copper, or bands of lead, zinc, &c., so that there may not be any one of them which shall not be in metallic communication with the bar which is destined to transmit the lightning to the damp

earth, and which runs down one of the upright walls of the building.

"Damp earth offers to the fulminating matter which is passing along a bar a channel, by which it escapes easily, and without detonation or damages, provided the bar plunges a little deeply into the earth.

"By a proper conductor, I mean, on the one hand, that it should go into the ground until it reaches earth which is always damp; and on the other, that it should be sufficiently massive to transmit the strongest lightning without being fused by it.

"A pointed rod is much more effective than a blunt one.

"In order to protect an extensive building it would be necessary to arm it with several lightning-conductors, and the less the length of the rods, the more they must be multiplied.

"In certain cases, oblique rods may do good service.

"Platinum points are to be preferred to copper ones; not only on account of their unalterability under the action of water or air, but also on account of their infusibility.

"The conductors should be preserved from rust by a coat of paint.

"When the conducting bar enters the ground, there is an alternative between two opposite difficulties.

"If the soil is humid, the fulminating matter passes off easily; but the metal rusts, and is soon destroyed.

"If the soil is dry, the bar lasts a long time; but it fulfils its function very badly. It was therefore very desirable to discover some substance which should be a good conductor, but which should not injure iron. Charcoal, when it has passed through a red heat, is of this description.

"In passing the eaves and cornices, the conducting bar is sometimes bent into a right angle, and sometimes into an acute angle. Such inflections become dangerous: care should be taken to make the necessary changes of direction by gentle curves.

"We do not learn from the Bible, or Josephus, that the Temple at Jerusalem was ever struck by lightning during an interval of more than a thousand years—from the time of Solomon to the year 70; although, from its situation, it was completely exposed to the violent thunderstorms of Palestine.

"By a fortuitous (?) circumstance, the Temple was crowned with lightning conductors quite similar to those we now employ, and which we owe to Franklin's discovery.

"The roof—constructed in what we now call the Italian manner, and covered with boards of cedar, having a thick coating of gold—was garnished, from end to end, with long pointed and gilt iron or steel lances; which Josephus says were

intended to prevent birds from resting on the roof and soiling it.

"The walls also were overlaid, throughout their extent, with wood thickly gilt. Lastly, there were, in the courts of the Temple, cisterns into which the rain from the roof was conducted by metallic pipes. We have here both the lightning-rods and a supply of means of conduction so abundant, that Lichtenbergh is quite right in saying that many of our present apparatuses are far from offering in their construction so satisfactory a combination of circumstances."

Deaths from Lightning.—M. Pacy has communicated a paper to the *Académie des Sciences* upon the subject of deaths from lightning, the materials for which were supplied by unpublished documents placed at his disposal by Dr. Farr, of the Registrar-General's Office. Prior to 1852 the deaths from fulguration were not regularly registered, and those since 1856 have not been classified. The deaths of the other years were as follows:—In 1852, 45 deaths; in 1853, 10; in 1854, 17; in 1855, 17; in 1856, 14; total for five years, 103. The year 1852 was remarkable for the number of storms which prevailed over the greater part of Europe. Of these 103 deaths, 88 took place in male, and 15 in female subjects. In respect to age, 48 of these deaths occurred between the ages of 1 and 15, and 55 between the ages of 25 and 65. In Sweden, of 56 deaths from fulguration which took place between 1846 and 1850, 28 were males and 28 were females—the maximum number occurring between 25 and 50 years of age; while in England the maximum occurred between 10 and 15. The 103 deaths were thus distributed in respect to months: April, 1; May, 14; June, 14; July, 38; August, 22; September, 8; and October, 6.

Precautions against Lightning.—When persons happen to be overtaken by a thunder-storm, although they may not be terrified by the lightning, yet they naturally wish for shelter from the rain which usually attends it; and, therefore, if no house be at hand, generally take refuge under the nearest tree they can find. But in doing this, they unknowingly expose themselves to a double danger; first, because their clothes being thus kept dry, their bodies are rendered more liable to injury, the lightning often passing harmlessly over a body whose surface is wet; and secondly, because a tree or any elevated object, instead of warding off, serves to attract and conduct the lightning, which, in its passage to the ground, frequently rends the trunks or branches, and kills any person or animal who happens to be close to it at the time.

Instead of seeking protection, then, by retiring under shelter of a tree, hay-rick, pillar, wall, or hedge, the person should either pursue his way to the nearest house, or get to a

part of the road or field which has no object that can draw the lightning toward it, and remain there until the storm has subsided.

It is particularly dangerous to stand near leaden spouts, iron gates, or palisadoes, at such times; metals of all kinds have so strong a conducting power for lightning as frequently to lead it out of the course which it would otherwise have taken.

When in the house, avoid sitting or standing near the window, door, or walls, during a thunder-storm. The nearer you are placed to the middle of the room the better.

Dr. Franklin's Recommendations.—Franklin recommends persons to avoid the neighbourhood of fire-places. Lightning does, indeed, often enter by the chimney, on account of the internal coating of soot, which is one of the bodies for which, as for metals, it evinces a preference.

For the same reason, avoid as much as possible metals, gilding, and mirrors, on account of their quicksilver.

The best place is in the middle of the room; unless, indeed, there should be a lamp or chandelier hanging from the ceiling.

The less the contact with the walls or the floor, the less the danger. A hammock, suspended by silk cords, in the middle of a large room, would be the safest place.

In the absence of the means of suspension, the next best place is on substances which are bad conductors, such as glass, pitch, or several mattresses.

These precautions must be supposed to diminish the danger, but they do not altogether remove it.

There have been instances of glass, pitch, and several thicknesses of mattresses being traversed by lightning.

It should also be understood that, if the lightning does not find round the room a continuity of metal, which it may follow, it may dart from one point to another diametrically opposite, and thus encounter persons in the middle of the room, even if they were suspended in hammocks.

The greater the mass and the volume of the conducting matter brought together in one place, the greater the chance of being struck by lightning in its neighbourhood.

There is another cause which may contribute to render numerous assemblages of men or animals dangerous during thunder-storms. Their perspiration cannot fail to occasion an ascending column of vapours, and it is well known that moist air is a better conductor of lightning than dry air; such a column has a natural tendency to attract the lightning, by preference to the place whence it proceeds. Need we, therefore, be surprised that flocks of sheep are so often struck by lightning, and that a single stroke should sometimes cause the death of thirty, forty, or even fifty of the animals?

Treatment of Persons struck by Lightning.—When a person is struck by lightning, strip the body, and throw bucketfuls of cold water over it for ten or fifteen minutes; let continued frictions and inflations of the lungs be also practised; electricity should also be applied where it is possible. Persons seemingly killed by lightning have frequently been restored by the ordinary means used in other cases of apparent death.

ACCIDENTS IN CONNECTION WITH BUILDINGS.

Prevention of Accidents in connection with Scaffolding.—The following remarks and suggestions, extracted from the *Journal of the Society of Arts*, for the prevention of accidents in connection with scaffolding erected for building purposes, or for the repair or restoration of cathedrals, churches, music halls, and other interiors, are earnestly recommended to the attention of architects, engineers, builders, masons, painters, decorators, plasterers, and others.

It can hardly be doubted that many of those painful occurrences, termed "accidents," which so often end in the loss of life or limb, and bring desolation and poverty into the houses of the working classes, are really not the result of inevitable circumstances, but arise from the absence of common precaution, and may not, unfrequently, involve a large amount of culpability. Acting under this impression, and with an earnest desire, for mere humanity's sake, to lessen, if possible, the number of casualties (whether to workmen or to individuals passsing below) which occur in connection with building and repairing operations, the writer, who is a disinterested party, suggests the adoption of the following precautions:—

Rope nets, of a three-inch mesh, and strong enough to resist any pressure likely to be applied to them, either by men or by materials, should be made in pieces 24 feet in length, by 6 feet in width or depth, at the corners of which, as well as at every three feet distance on the edges, should be securely placed stout galvanised iron rings, through all which should run a rope to make the net or nets fast to the upright scaffold poles, on which should be fixed somewhat stouter rings, or cleats, for the like purpose. The net (formed, if necessary, of several pieces united) should be drawn quite close to the front of the scaffolding, and be shifted from time to time, so as to form a sort of gallery wherever work might be going on.

Nets of similar strength and dimensions, and furnished with rings exactly as above, should also be drawn close under the loose foot-boards, the outer edge of the under-guard thus formed

being fastened to the lower edge of the front or upright net by a rope passing through the openings in the nets and through the iron rings, at each of which latter the rope might be half-knotted for additional security. A rope should be also passed through the rings of the inner edge of the under-guard, and be made fast to some column or beam, or other part of the building itself.

When the foot-boards are bolted or otherwise fixed down to the ledgers or cross-supports, the under-guard might be dispensed with, provided the boards and supports are all perfectly sound, and the front-guard well secured close to the scaffolding.

The front net, with another net attached, to be drawn under the scaffold boards in use, might be suspended from pulleys fixed to short projecting arms or cranes at the top of the scaffolding, so as to be easily swung free, and be shifted up and down whenever necessary—care being always taken to secure the front net to the upright poles, and to draw the under net quite home, either to the inner scaffold poles, where used, or to the building itself.

It is suggested also that the upright or front net should be carried round the ends or sides of the scaffolding, so as to form a sort of gate for the passage up of workmen or materials.

For under-guarding wide-spread scaffoldings put up for the repair or decoration of cathedrals, churches, music-halls, or other spacious interiors, especially in the case of roof or ceiling operations, as many nets as might be necessary should be laid on the ground, edge to edge—(and if they were all of uniform size, with rings at three feet distances, &c., they would fit and unite easily, and several parties to a contract could join their nets)—and a rope, of the same gauge as the nets themselves, should be laced in and out to unite the various pieces firmly, the rope being half-knotted at each ring for additional strength; and the whole being raised in convenient portions and secured close underneath the scaffold boards. Thus any number of nets could be joined, and the largest floor of loose boards rendered comparatively safe. The edge of the scaffolding, wherever exposed, could also be "guarded" by carrying the upright nets along it, and making the rope passing through the top-wings fast on each side of the building; the net being stiffened by the insertion of a few upright struts of wood or iron into the foot-boards, or lateral poles, or by a line carried to a higher part of the scaffolding or building.

Were the precautions here recommended generally adopted, it is believed that not only would many accidents to the operatives themselves, whether from their own heedlessness or from the use of decayed or defective boards, from stepping back to view their work, or from what are familiarly called "bricklayers'

traps," be prevented, but additional protection would be afforded to persons working or passing below, whether in the street or the edifice; also against injury from the fall of planks, bricks, implements, &c.

There should be a distinct understanding, in all building and repairing operations, as to the individual, whether the builder or his foreman, or other party, responsible for the strength and proper construction—in a word, adequacy—of any scaffolding. It is also a question how far buildings might be erected from the inside, and external scaffolding be dispensed with.

Upon, or immediately under, all scaffoldings covering the footway, especially in London and large towns, a tarpaulin, or guard of other impervious material, should invariably be placed to prevent the fall of bricks or other articles, as well as annoyance to passengers from dust, &c.

Dangerous Structures in London.—Mr. Haywood reports upon the works executed by the Commissioners of Sewers during 1858 in the city of London, that "the results of the passing of the Metropolitan Building Act, of 18 and 19 Vic. cap. 122, which placed the control of buildings ruinous and dangerous within your hands, may be best gathered from the following abstract. The Act became operative on the 1st of January, 1856:—

	1856.	1857.	1858.
Number of structures reported upon by the Surveyor appointed by the Commission	236	448	268
Number of cases heard before the magistrate	24	105	37
Number of buildings shored by during the year	150	77	37
Number of cases certified by the Surveyor as being completed	170	388	257"

It is worthy of remark that with all the increased supervision of structures in the City, and in the metropolis generally, accidents by the falling of the entire structures, or portions of them, seem to be more numerous than ever. Whenever these accidents occur, a cry generally is raised for augmented powers to be given to the district surveyors, or other public officers, or for an increased number of them, and for the more vigilant and constant supervision of buildings; and this expectation of guarding against all possible calamities by official care and inspection appears very general. Mr. Haywood is convinced, from a careful consideration of the circumstances attending accidents of this nature, that no amount of official inspection will prevent their occasional occurrence; but, on the other hand, it is greatly to be feared that, by leaning so much on official supervision, the sense of personal responsibility of owners, occupiers, builders, and architects, specially connected with the buildings, will be weakened; and anything which has this tendency must rather help to increase than diminish accidents.

Means of Exit from Buildings in cases of Panic.—Numerous instances may be mentioned of a want of foresight on the part of the architects and builders of our places of public resort. The calamitous accident at the Surrey Gardens in October, 1856, by which seven lives were lost, and a far greater number received serious injuries, while it proves how far the influence of panic will extend, shows also that much of this deplorable destruction was occasioned through the very inadequate nature of the means of exit from the galleries. Notwithstanding all that has been said respecting this great want in metropolitan public buildings, it does seem astonishing that a concert-hall, professedly built to accommodate fourteen thousand people, should have been so deficient in its staircases as the Hall proved itself to be on the first serious trial.

Instead of wide flights of steps, broken at intervals by simple landing-places, the only means of exit from the ample galleries, holding some thousands of persons, were from circular staircases of small diameter, and so slightly balustraded that one of them gave way on the first pressure of the crowd.

At the inquest held on those who were killed on this distressing occasion, it appeared that the crowd—as is usual at panics—made for *one* exit, although there were four from the galleries. This fact should teach architects that all the pressure may at any moment be concentrated upon one exit, and, therefore, each staircase should be constructed to bear safely a stream of battling and struggling people considerably more voluminous than ordinarily pass over it.

ACCIDENTS IN FACTORIES.

Causes of Accidents.—We have no doubt that the inspection system has done much to reduce the sickening array of horrid calamities, falling chiefly on children, and arising from a gross sacrifice of their safety to a miserable economy.

The difficulty which the factory inspectors sometimes experience in getting dangerous machines effectually protected is a painful proof of the necessity of the partial control exercised by them.

The accidents arising from machinery are of a frightful character, in many cases necessitating amputation of the legs, feet, hands, or arms; fractures of limbs and bones of trunk, and of the hand or foot, are unhappily many; injuries to the head and face are also numerous. The largest proportion of accidents by machinery occasion lacerations, contusions, and other injuries not enumerated above.

The accidents not arising from machinery occasion, among others, fractures of limbs and bones of trunk; injuries to head and face; lacerations, contusions, and other wounds.

Accidents in Factories.—In the six months ending April 30, 1860, there had been 2,047 accidents in factories arising from machinery, of which 302 were of children, that is, persons under 16 years of age, and 944 of young persons above 16 and under 21 years of age. There had also been 229 accidents during the same period not arising from machinery.

Improved Condition of Factories.—Under the Government supervision of factories, now strictly exercised, there is every reason to hope that the number of accidents will greatly diminish, and the reports of the official inspectors lead us to hope for such a result. The moral condition of the factory operatives is greatly improved, and is a potent means of arresting careless habits, which are the main cause of accidents.

ACCIDENTS FROM NOXIOUS EMANATIONS.

Sewerage Emanations.—The frightful accidents, attended in many cases with fatal results, that have occurred to persons engaged in sewerage works, show the dangerous consequences of allowing the poison-gases to remain confined for any length of time. Professor Faraday has given his opinion that the rapid removal and deodorisation of the sewage should be effected by copious dilution with water.

The Use of Charcoal for Gas Emanations.—The power of charcoal of absorbing putrid miasms in a *vaporous* condition is very great. When dead bodies are covered with charcoal to the depth of a few inches, putrefaction goes on with great activity, but there is no bad smell; for the charcoal absorbs the gases, and causes them to enter into combination with the oxygen of the air, forming compounds which are inodorous. Dr. Stenhouse showed that air impregnated with ammonia, sulphuretted hydrogen, and sulphide of ammonium, passed through charcoal, could be then breathed with impunity; and therefore proposed its application to the gullies, ventilators, and house-drains of a system of sewerage. Dr. Letheby has ascertained that the gases from a cesspool are completely deodorised by passing them through a small box containing about thirty-six inches of coarsely-powdered peat charcoal. He did not renew the charcoal for three months, and yet discovered no loss of power. He therefore says:—

"Now, in making a practical application of these facts, it is manifest that we have in common wood-charcoal a powerful

means of destroying the foul gases of sewers. How it is to be applied is a question of but little embarrassment. Ventilate the sewers as you will, either by the open gratings in the streets, or by the rain-water pipes of the houses, or by the pillars of the gas-lamps, or by tubes carried up at the landlord's expense from the drains of every house, or by special shafts in the public streets—in fact, let the gases go out of the sewers as they will, and where they will, you have but to place a small box, containing a few pennyworth of charcoal, in the course of the draught, and the purification of the air will be complete. As far as we know, the strength and the endurance of this power is almost unlimited; so that, when once the air-filter has been set up, it will last continuously for years. Its action also upon the draught is not particularly injurious. The temperature of the sewers, and the agencies which are now at work in circulating the air and ventilating them, will be sufficient to keep a current of foul air through the filters; and, if these were multiplied to a large extent, the friction of the gases upon the charcoal would be reduced to an insignificant amount.

Fatal Gases from Ale-vats.—A few months past, a fatal accident happened to a man employed at the Old Brewery, Bradford, to watch one of the large square stone vats, in which was a quantity of ale in a state of fermentation. By some means, the band attached to a valve in the bottom of the vat had been broken, and the deceased, when endeavouring to piece it, bent over the side; but, with a singular degree of carelessness, had not turned his face upwards, or kept in such a position as to avoid the carbonic-acid gas, which was then rising from it very strongly. The man was suffocated in an instant, and unable to raise himself up.

Mortality of Infants by Carbonic-acid Gas.—Two inquests have lately been held by Mr. Wakley, coroner for West Middlesex, upon the bodies of two infants under six months old, who were suffocated by carbonic-acid gas, arising from inhaling their own breath under bed-clothes during the night. The coroner took occasion to state that the evil of infants being suffocated by mothers from want of precaution was becoming truly alarming. During the winter and cold spring months, the mortality of infants from this cause was 50 per cent. more than in the summer and mild autumn months. He earnestly hoped in time, with the aid of the press, to be successful in eradicating this deplorable evil.

Hints to Housekeepers about their Sinks.—As fever, ague, and death have frequently been occasioned by emanations from the sinks of houses, we would suggest that every housekeeper should occasionally pour a little of the chloride of zinc solution into the sink; and at night, in those houses which have under-

ground kitchens, and drains which lead to the main sewer, a wet cloth, or, better still, a flannel which has been steeped in the solution, should be placed over the aperture. This step is necessary, as, during the flushing operations of the sewer, the foul gases are driven up through the house-drains into the kitchens, to the great injury of all in the house.

It is worthy of note that all metal articles discovered on the persons who have been suffocated by sewerage emanations are found to be blackened, proving the large accumulation of sulphuretted hydrogen.

How to examine Wells.—The following simple method of examining a well, to ascertain whether it contains any offensive substances, has been recommended as efficient:—Place a common mirror over the well in such a position as to catch and throw the rays of the sun to the bottom of the well, which will be immediately illuminated in such a manner that the smallest pebble at the bottom can be distinctly discerned as if in the hand. The sun is in the best situation to be reflected in the morning or afternoon of the day.

GUNPOWDER EXPLOSIONS.

Unaccountable Explosions of Gunpowder.—Gunpowder is a chemical combination of an extremely treacherous nature. Although not so uncertain as gun-cotton and fulminating silver, it is, from the difficulty of defining to what length it may be trusted, of the same coquetish family. Gun-cotton, it has been proved, in the making of rockets, may be rammed by a succession of gentle taps, or by the whole force of hydraulic pressure, some nine thousand nine hundred and ninety-nine times with perfect impunity, and then a child shall drop a mere rod upon it, and cause the loss of many lives.

Fulminating silver may be stirred with impunity two or three times a day in a wooden bowl, with a wooden stick, for a period of some ten or fifteen years, and yet this simple act shall at some other time scatter into space a large factory, spread dismay throughout Bow Street and Piccadilly, and strike the ingenious inventor of wire-cartridges a corpse.

Prevention of Explosions.—General Piobert, of the French Artillery, has made a discovery by which the explosion of gunpowder in magazines is much less liable to occur. It consists simply of mixing the gunpowder with coal-dust. When the gunpowder is required for use, it is only necessary to sift it; the coal-dust falls through the sieve, and the gunpowder resumes its original qualities. The experiment has been tried

on a large scale with complete success. A magazine filled with gunpowder so mixed was set on fire. "No explosion took place," says the *Moniteur de l'Armée*. "The gunpowder burned like other combustible matters, such as pitch, or tar, and the fire was extinguished with common pumps."

Diminishing the Effects of Gunpowder Explosions.—A plan for diminishing the liability of powder-mills to explosion has been proposed by Mr. F. O. Ward, who had communicated on the subject with Mr. Faraday.

The plan consists in supplying to those portions of powder-mills in which the powder is treated dry, an atmosphere incapable of supporting combustion—preferably carbonic-acid gas—so as to obviate the danger of explosion, so far as it arises from chances of ignition *ab extra*, as by the spark from a workman's pipe. The danger of explosions from the liberation of oxygen from the powder itself, by friction or otherwise, would of course remain; but this is a less frequent cause of explosion than ignition *ab extra*, occasioned by the carelessness of workmen rendered indifferent to risk by long habit, and emboldened by impunity. Mr. Faraday, in his comments on this plan, approves it as adapted to cut off one class of risks, and so to remove the point of danger farther off, and also as not likely to deteriorate the quality of powder immersed in the protective atmosphere. He mentions, however, a source of danger usually unsuspected, the possibility of the ignition of the gunpowder-dust which collects in the beams of powder-mills, and by which, he believes, explosions may be originated, as well as by the heating of the grains actually under trituration in the mill.

Light in Powder Magazines.—At Southsea Castle a number of Chappuis' reflectors have been fixed, to supersede the dangerous necessity of using lamps or candles inside the powder magazines. They reflect from one to another, and are said to be very efficient. The idea of their employment in this position seems an excellent one.

Removal of Gunpowder Works to safe Distances.—The causes assigned for the non-removal of gunpowder works to such safe, because desolate, places as Salisbury Plain for instance, or to floating and disconnected factories in the centre of large lakes, are thought by some to have reason in them. "Distance of transport increases the danger of explosions, &c.," for example. But, if this be true, how is it that we never hear of explosions of large quantities of gunpowder after it has quitted the works? At Bugsby's Hole on the Thames—the place named by Government for the shipment of gunpowder—nothing more than the most trifling accidents have happened; and we cannot call to mind any occasion in which an accident has happened between that spot and the several mills throughout the

kingdom, or, after this land-carriage, on the many thousands of miles which the powder has had to travel by water.

Position of Gunpowder Works.—In Austria the most dangerous stages of gunpowder manufacture are wholly conducted in pits and excavations beneath the surface of the earth. The consequences of a "blow" under such circumstances is to expend the whole lateral force of the gunpowder upon the sides of the trench, and these, being elastic in their nature, act as a buffer to deaden shocks seldom felt beyond a comparatively few yards from the place of the explosion. The upward tendency of the "blow" is of course directed against the heavens only. It is evident that this practice receives the sanction of the British manufacturer, for he essays to imitate the Austrian, but proves, in so doing, that there are two ways of attempting the same thing—a right and a wrong. While admitting the principle, our manufacturers erect their mills upon the *surface* of the soil, and surround them and their dangerous charges with a raised mound of earthwork. When a "blow" takes place this encrusted barrier is scattered in pieces to the four quarters of the winds, and deals destruction to life and limb to all within its range. At the recent explosion of the Hounslow Powder Works, not a vestige of this mound was left standing, and the oft-repeated assertions of the advocates of its utility, who state that such opposing walls must be necessarily blown to harmless dust, must have received the most convincing evidence of their error in the huge pieces of the wall which were scattered to some fifty yards or more from their positions. We fear that if "a return of the accidents resulting from the manufacture of gunpowder" were to be moved for and honestly rendered, it would afford a fearful account of killed and wounded.

Employment of Convicts in Gunpowder Works.—The suggestion that convicts should alone be engaged in the more hazardous employment of gunpowder works is, we are informed, at length engaging the attention of the Government.

Causes of Gunpowder Explosions.—A notice of a few of the many causes of the explosion of gunpowder mills may be interesting. At Dartford, a cricket-ball, struck by the batsman across the stream, fell upon the gravel-path, and bounded from thence into the trough of the grinding-wheel. The ball, getting beneath the wheel, caused it (what is technically called) to "kedge," or drag. Friction was occasioned thereby, and an explosion was the consequence. The boy who ran round to get the ball saw the state of things, plunged, head foremost, beneath the stream, and arose uninjured amidst a shower of falling *debris*.

In loading a wagon from a punt a barrel of powder fell, and, exploding, caused the destruction of several lives.

A man, half immersed in water, while cutting the hedges at the side of the river which feeds the mills, struck his sickle against a stone and occasioned a spark. He saw with fear little trains of smoke arise over the powder-bestrewed path, but had the presence of mind to scoop up water with his hands, and throw over and put out the dangerous ignition. At one mill eleven men and seven horses were blown to fragments. A boy, whose duty it was to stand at the horses' heads of one of the wagons, complained of cold, and got another lad, who was passing, to take his place while he went into the corning-house to warm himself. While thus employed the accident occurred.

It has been before remarked that great atmospheric changes have often preceded the explosion of gunpowder works, and the occurrence at Hounslow was not an exception to this fact.

The great risk of explosion in the manufacture of gunpowder lies in consequence of the large stone wheels called "runners" being separated from the stone beds only by the charge of composition, which is merely half an inch thick. If by any chance the composition should become removed, the runners would come in contact with the bed, and a spark be probably produced which would explode the charge. Great care is necessary, when selecting the runners and bed, to take only such stones as have the smallest quantity of pyrites or flints, as it is from these that the production of sparks is most to be apprehended.

The "dusting" house is where the fair-formed grains of powder are sifted from the dust. The operation is so dangerous, that a large wooden screen is erected all round the house (Gunpowder Mills at Twickenham) in order to keep cloud-like dust from being wafted by the wind towards any of the boiler furnaces, for the slightest spark falling from the chimney-stacks into the dusty cloud would explode the whole. It being thus necessary to keep the dust within a limited space, the men employed in the work are exposed to its noxious influence.

Recklessness of the Workmen in Gunpowder Works.—We can readily believe how men who, day by day and week by week, are dealing with gunpowder manufacture, at length become careless and indifferent, and consequently, at last, meet an untimely end. In worldly matters, and in the usual proceedings of every-day life, we have our warnings; a slight accident may prevent a greater; but here it is perfect safety, or the being blown to atoms. Then, when some downright carelessness has been committed, and each witness has departed in fragments over the neighbouring trees, it is not unusual to call upon some profound philosopher to explain the cause of an accident, the effect of which alone is visible. Thus science sometimes prevents the workmen of other manufactories from deriving a useful lesson; for the accident, instead of being proved, as was

most probable, to have arisen from a lucifer in the pocket, or a spark, is by these learned individuals attributed to some wonderful chemical paradox, of even the elements of which the workmen are totally ignorant.

As an example of the recklessness which is at length felt by those who are in the habit of entering buildings of this description, we may mention the following anecdote, related by an eye-witness:—

In the early part of the present century, one of the workmen belonging to the royal gunpowder establishment at Waltham Abbey, on returning from his dinner, was, contrary to orders, smoking a pipe. When he approached a building called the Gloom-store, where the powder was dried, and which was situated on the Horse-mill Island, he put the pipe in his waistcoat pocket without extinguishing the tobacco. Soon after, it was observed by one of the workmen, called "Old Ben Wall," who was remarkable for his coolness and courage, that the man's pocket was smoking. He knew that if he called his attention to it, the result might be still more dangerous, as the man was just about to enter the building; he therefore called him on to the platform close to the river, and, with a well-directed push, sent him sprawling into the water, and thus probably saved the lives of many of the men.

New Act on Gunpowder and Fireworks.—This Act, to amend the law concerning the making, keeping, and carriage of gunpowder and compositions of an explosive nature, and concerning the manufacture, sale, and use of fireworks, will, no doubt, be the means of averting many disasters. The object of this Act is to prevent a recurrence of the serious accidents which have happened by the explosion of gunpowder and fireworks. Numerous provisions have been framed with this object, and the regulations are to be enforced under penalties. "It shall be lawful for the justices of the peace for each county, or other division, at their general quarter sessions, or for the council of any borough, upon application made to them by any person, from time to time, to license places for the making of loaded percussion caps, and for the making and keeping respectively of ammunition, fireworks, fulminating mercury, or other explosive preparations or compositions, and to determine the quantities of such articles respectively to be kept in any place so licensed, and to grant licences to persons to sell fireworks." No person is to sell, or offer or expose for sale, any fireworks without a licence, or to sell to any person apparently under sixteen years of age, under a penalty of any sum not exceeding £5; and a like penalty is to be enforced for throwing any firework in or into any thoroughfare or public place. Owners of mills may make rules for their servants and workmen for preventing accidents.

STEAM-BOILER EXPLOSIONS.

Society for the Prevention of Steam-Boiler Explosions.—An association for the prevention of boiler explosions was formed at Manchester at the commencement of 1855, originating in a great degree from a feeling of regret at the lamentable loss of life resulting from frequent boiler explosions, it being evident, from the rapid extension of the system of high pressure working, that, unless some steps were taken, these accidents would probably increase. The principle of the association is the voluntary appointment of an inspector, and under him of sub-inspectors, whose duty it is to pay periodical visits to, and make inspections of, the machinery of members of the association, and who tender such suggestions and recommendations as are deemed advisable for the safe working of the steam-engines and the economy of fuel. So excellent an example ought to be adopted in all the manufacturing and mining districts of Great Britain.

The fact that steam, in contact with water in a quiescent state, may be heated to 500° or upwards, without any corresponding effect upon the steam-gauge, appears to be established, but the precise conditions under which the surplus heat thus accumulated might lead to explosion is not fully known, and is a proper subject for investigation, as also the question of heating the steam in its passage from the boiler to the steam-cylinder. At the close of 1855, the number and description of engines under the inspection of the association at Manchester were:—Cylindrical, with internal flues, 589; cylindrical, without internal flues, 45; Galloway's patent, 97; multitubular, 87; Butterley, 64; wagon, 38; total, 920. These were working at pressures varying from 15 pounds to 80 pounds per square inch, and 81, or nearly 9 per cent., had been found to be in a dangerous state: 24 from construction not adapted to pressure; 9 defective in plate or angle iron; 26 defective in mountings; 19 injured by deficiency of water; and 3 from deposit of scale. In addition to the above 19 injured by deficiency of water, there were 14 others affected by the same cause, but in a less degree. This is the most frequent cause of explosion, and open standpipes and fusible metal plugs are recommended as preventatives.

When this excellent association was formed, few persons knew more than the general public knows now of the causes of such explosions. The proceedings on coroners' inquests were rarely of any other use than to expose the darkness in which the whole subject was involved. The more ignorant witnesses were usually provided each with his own theory, while the more educated parties concerned could only say that they really did not know, often could not even guess, how the mischief was

done. The progress now made in obviating accidents, and in approximating to the true theory of boiler construction under all circumstances, justifies the hope that no more lives will be lost in this barbarous manner, when it is generally known what may be done in the way of prevention. In 1856, the year following the formation of this society, there were thirty-one boiler explosions in Great Britain, *not one of which occurred within the pale of the association.* Those thirty-one explosions killed fifty-eight persons, and seriously injured seventy more.

The firms composing the association represent many kinds of manufacture—from the cotton-spinners to the chemists or metal-founders; from saw-mills and sugar-mills to India-rubber, paper, and glass-manufacturers. Their dangerous boilers have been rectified in time, instead of only proving their condition by exploding, which is the usual process, even under the most careful tendance, short of periodical, scientific examination. The members pay a small entrance-fee, which is appropriated to the series of experiments instituted to illustrate the dark parts of the subject. For a small annual fee they obtain a thorough periodical examination of their apparatus; and, by paying an additional fee, they can command the services of the engineers at any time.

What hinders an extension of this method over the whole area of British manufactures?

To Prevent Explosions of Kitchen Boilers.—Several fearful accidents having occurred from the bursting of kitchen boilers, the following suggestions will be useful to householders:—There ought to be a safety-pipe from the boiler conducted up the chimney, higher than the level of the supply cistern, and then conducted out of the chimney to any place where the issuing of excessive steam would be noticed. For that purpose it may be re-conducted to the kitchen, where the escape of steam would demonstrate to the cook that the water in the boiler was dangerously low, and that she must let the fire go out, or burn the boiler, for an explosion could not take place, simply because the pipe would act as a safety-valve for any steam that might be generated, and it could not be frozen up from its warm situation in the chimney.

The makers of kitchen boilers are as culpable for putting up their boilers without these escape-pipes, as manufacturers would be for working their large boilers at their mills, without blow-off valves, which is actually the condition of the greatest number of house-boilers at present, which have only a flow and return-pipe to and from the cistern, where they are liable to be frozen up. It is not generally known that the freezing up of even cold water-pipes may be prevented by allowing the water to trickle, even in a very minute stream, from one of the taps

constantly during a hard frost. It is surprising what a quantity of hard frost is required to congeal a running spring.

BURNS AND SCALDS.

Causes of Accidents.—Among the 14,000 lives annually lost by violence, are counted more than 1,800 cases where children are burnt or scalded to death. These numerous deaths by fire, and other still more numerous injuries which are not fatal, are referable to the domestic habits of parents, occurring almost exclusively among the poorer classes, where children cannot possibly be tended with the same vigilance as among the rich. Probably a large share of these casualties arises during the absence of mothers engaged in branches of industry which take them from home; and it seems likely that the evil would diminish with the development of well-conducted *crèches* and infant schools, which, on other accounts, are so very greatly to be desired for the infant population of places where mothers are engaged in manufactures, and other non-domestic industry.

Scalds.—Scalds from hot water, unless very extensive, are generally least severe, because the scarf-skin only is raised, as in a common blister. Scalds from boiling oil or varnish are more severe, because, as they stick to the skin, the heat is longer applied, and the true skin is more likely to be destroyed, either without or with a blister being formed.

Treatment of Burns and Scalds.—Accidents from fire or hot water are so frequent and so sudden in their occurrence, and so dangerous sometimes in their consequences, that almost every one should have some knowledge of the modes of treating them.

The extent of such accidents must necessarily be various; consequently all cases of burns need not be treated precisely in the same manner. A burn may consist simply of inflammation, or it may be accompanied by vesications, or the mischief may be still greater, and the part may be killed. Burns may be divided into three states or conditions. The first is where the injury consists in a simple blistering of the outer, or scarf skin, which remains unbroken; the second, where the outer, or scarf skin, is extensively separated from the surface of the true skin, so that the minute extremities of the nerves are exposed, which is most frequently the case from the application of fire; the third is a still deeper injury, in which the life of the true skin is destroyed, and where the process of suppuration is absolutely necessary.

The danger of the first state is but little, provided the vesications or blisters are not disturbed. It is a principal object to

keep the blister from breaking, as a considerable discharge would come on, creating great irritation, and consequently danger. Cold applications are the best in these cases: cold water, vinegar and water, or scraped potatoes, may be used. When the heat and inflammation have subsided, leave these off, and apply a liniment composed of three ounces of olive or linseed oil, added to six ounces of lime-water.

There is one case in which it is not advisable to employ cold water, namely, in cases of extensive scald. It appears that, when the scald extends over a considerable space, the system feels the injury so much, and is so much disposed to flag, that the use of cold applications materially depresses the vital powers, and prevents a reaction. The danger attending on the second state described is greater than in the preceding, owing to the increased sensibility of the parts, and the instant suppression of the natural functions of a large portion of the skin, anddeath may take place soon after such an accident when extensive. In this case the pulse is quick and small, the patient frequently chilly, and, if the termination is unfavourable, he ultimately falls a victim to the first impression. The best practice here is to apply lime-water and milk, in equal proportions, as a lotion; or a liniment of olive oil and lime-water, which may be frequently spread over the parts with a pencil or feather. This liniment should consist of half a pint each of lime-water and olive or linseed oil, mixed with an ounce of rectified spirits of wine. At the same time, it will be right to give the patient a little warm wine and water occasionally, especially if chilliness is complained of, and about ten, fifteen, or twenty drops of laudanum should be given once or twice in the first fourteen hours. As to the quantity of laudanum to be given, we must be guided by the pain and symptoms of irritation, or of exhaustion present. The stupor with which patients severely burnt are often attacked receives more relief from opium than anything else.

After a short time, the parts granulate, and throw up small red eminences, which is a necessary process previous to healing, when a lotion, consisting of twelve grains of sulphate of zinc, mixed with half a pint of cold water, should be applied by means of a linen rag, and it will promote the formation of a new skin, even over an extensive surface.

In the third state, though there is no immediate danger, yet there is a remote one; for the skin, being destroyed, separates and forms an eschar, which must naturally debilitate the living powers, by calling on them beyond their natural capacity. In this condition we find stimulating applications of the greatest service. The injured parts are to be bathed two or three times with spirits of wine, or spirits of wine with camphor, or spirit of turpentine. After this let a liniment be ap-

plied on soft cloth, composed of the common yellow basilicon, softened with spirit of turpentine. This should remain on, untouched, for fifteen hours. At the second dressing wash the parts with proof spirits of wine, or tincture of opium, made warm, and then dress as before with the common yellow basilicon, softened with camphorated oil, instead of turpentine. On the third day milder applications must be employed, and a dressing once in twelve hours. Powdered chalk may be used to absorb any great degree of discharge from the ulcer.

According to Baron Dupuytreu, extensive and deep burns always occasion inflammation of the mucous or serous membranes of the digestive organs; a circumstance supposed to explain those curious instances of death, which so often occur when the ulcers are on the point of healing.

When burns are produced by gunpowder, some of the grains may be forced into the skin; these should be picked out with the point of a needle, and an emollient poultice applied, which will dissolve and bring away any particles of gunpowder yet remaining.

In this third state of deep burns which must ulcerate, stimulants internally are likewise advisable, and a dose of laudanum should be administered after receipt of the injury, proportionate to the age of the patient, and the severity of the symptoms. A little wine and water, or beer, should follow occasionally, till suppuration takes place, when any stimulant will no longer be required, except a very moderate quantity, to support the strength under any great discharge.

In deep and extensive burns, continuing the stimulating process too long is dangerous. In the cases of some men burnt at Covent Garden Theatre, all died in a few days, of an extraordinary nervous affection, although they were previously apparently doing well. This arose from the wine and cordials brought to them by their friends, so that they lived too freely.

Burns produced by hydrogen-gas, which are of such frequent occurrence in collieries, differ in their nature from those arising from other causes, and require a somewhat different treatment; inasmuch as the former, although rather slight, require a stimulus even from the beginning, which the others do not. It is in burns from the explosion of hydrogen-gas, sometimes called choke-damp, that the oil of turpentine is so very beneficial.

WOUNDS, BRUISES, CONTUSIONS, AND SPRAINS.

Wounds resulting from mechanical injury should be first washed with cold water; the edges should be brought together taking care that they are kept in apposition by one or more,

compresses of linen rag steeped in an arnicated lotion, and secured by a strip of linen rolled round the part. The lotion should be discontinued in three or four days. In contusions and bruises, when the skin is not cut, an arnicated lotion will be suitable, applied twice or thrice a day.

For sprains, an arnicated lotion is desirable, and a frequent application, on a linen rag, should be made. A sling should be used in cases of sprains of the wrist, elbow, or shoulder joint, and a perfect rest of the injured part should be enjoined.

The virtues of arnica for accidents of this character cannot be too highly recommended; and every housewife should be provided with a small bottle of this invaluable agent of recovery from certain accidents. Arnica acts upon the absorbents, and is, consequently, admirably calculated to promote the absorption of effused blood, and the reparation of tissues after mechanical injuries.

MISCELLANEOUS ACCIDENTS.

The report of the commissioners appointed to inquire into the costs of prosecutions, the expenses of coroners' inquests, &c., gives numerous instances of the number and kinds of deaths from accidents, affording a curious insight into "the ills that human life is heir to," and proving the truth of the words that "life hangs upon a thread."

Among the causes of death we find those of falls of timber upon persons; scalds and burnings; injuries to various parts of the person from instruments; gun-shot wounds; falling from carts; a man who brought the drags to a drowning person, when he suddenly burst out bleeding and died; a man with a lacerated wound, caused by "skylarking" with a bottle; falling from stone steps, and ladders; drowning; a captain jammed by the shooting of luggage on board a ship; accidental suffocation; falling down stairs; falling from a book-case; falling from a chair; falling from a load of hay; falling whilst getting on a hurdle; falling from a chest of drawers, from a table, from a tree he was lopping, from a van, from the foot-board of an omnibus, from a window, from a loft, from a bed; wounded wrist from broken glass, while cleaning windows; hand cut by a steam-saw; a fender falling on him; struck by a tile blown from the roof of a house; struck by iron plates while removing them; struck by an iron slab while removing it; a stone falling on foot when removing it; slate falling on the person while removing it; kicked by horses; falling while riding on the shaft of a cart; beer-barrels in a dray rolling on a drunken man; lamp-post fell from a cart upon a man; fractured leg between two planks of a barge a man was repairing.

Numberless are the accidents to which we are daily exposed. Our space will not permit us to enlarge on this subject, but, by way of caution, we will conclude our little book with a few instances and recommendations which may be useful.

Drinking Cold Water in Warm Weather, or when Heated by Exercise.—Avoid drinking whilst warm, or drink only a small quantity at once, and let it remain a short time in the mouth before swallowing it; or wash the hands and face and rinse the mouth with cold water before drinking.

If these precautions have been neglected, and the disorder incident to drinking cold water under such circumstances has been produced, the first, and, in most instances, the only remedy to be administered is sixty drops of liquid laudanum, in spirit and water, or warm drink of any kind.

If this should fail of giving relief, the same quantity may be given twenty minutes afterwards. When laudanum cannot be obtained, rum and water, or warm water should be given.

In Britain, the most common form of death from drinking freely of cold water, or other fluids, while overheated, is sudden, arising from the impression on the stomach. It is not uncommon for people who have committed this imprudence to drop down instantaneously, and die on the spot.

When combined with exposure to a burning sun, as in hot climates, drinking cold water when the body is overheated seems often to excite, along with irritation in the stomach, congestive apoplexy. Dr. Watts relates the effects that occurred in the neighbourhood of New York, during the hot season of 1818. During the summer of that year the thermometer often stood in the shade so high as 92°; and the labourers in consequence could not be restrained from drinking frequently and excessively of cold water. Many were attacked with pain in the stomach, sickness, giddiness, and fainting; next with difficult breathing, and rattling in the throat; then with apoplexy, and several perished. These symptoms are very like the effects of some narcotico-acrid poisons.

Some persons on eating ices, or drinking iced-water, or cold ginger-beer in the hot days of summer, are attacked with violent colics.

In the hot summer of 1825 it was remarked, that a great number of persons who used to frequent a particular coffee-house in the Palais Royal, at Paris, and the owner among the rest, were severely affected with cholera. Poison being suspected, a judicial inquiry was instituted. It was proved, however, that similar accidents had been observed at other coffee-houses, in other cities, and likewise in former hot seasons; and when the whole medical evidence was referred to a commission of physicians and chemists, they gave their opinion that the

disease was owing to the incautious use of ices and iced-water in an unusually hot summer.

Hoffman says he was acquainted with instances where fatal inflammatory fever was induced by drinking too freely of cold water, and a suspicion of poisoning, in consequence, excited.

Caution in the Use of Charcoal.—The fact of charcoal giving no smoke, which renders it so convenient for cooking purposes, makes it necessary to remember that its combustion cannot go on without the formation of carbonic-acid gas, the dangerous nature of which is well known. This gas, indeed, being heavier than atmospheric air, generally occupies the lowest place in the apartment, and is, perhaps, almost always below the level of ordinary breathing; yet a certain quantity cannot fail to mingle with the air, and render this unwholesome to breathe. The air arising from charcoal when burning is as clear and invisible as common air; but this very circumstance prevents us from perceiving its presence, and it may therefore prove highly dangerous before we are aware of it. The air rising from coal or any other fuel likewise contains much carbonic-acid; but the smoke which always accompanies it gives warning, and becomes highly disagreeable before it is dangerous. This is not the case with the vapour of burning charcoal; hence so many fatal accidents from its use in confined places where there is no flue. The first sensation when it has become dangerous, is a slight sense of weakness; the limbs seem to require a little attention to prevent falling. A slight giddiness, accompanied by a distinct feeling of a flush or glow on the face and neck, succeeds. Soon after the person becomes drowsy, wishes to sit down, but commonly falls on the floor, insensible of all about him, and breathes strong, snoring as in apoplexy. If the person is alarmed in time, and escapes into the open air, he is commonly seized with a violent headache, which generally abates. But when the effect is completed, as above described, death very soon ensues, unless relief be obtained. In short, the effect is suffocation. The most prudent treatment in a case or accident of this kind, is to take off a quantity of blood immediately, and throw cold water on the head repeatedly. A strong stimulus, such as hartshorn, should be applied to the feet.

Noxious Vapours from Wells, Cellars, Fermenting Liquors, &c.—Procure a free circulation of air, either by ventilators, or opening the doors or windows where it is confined, or by changing the air, by keeping fires in the infected place, or by throwing in stone-lime recently powdered.

Before any person descends in a well or vault, whether it has been closed any time or not, it is right to try whether the air be such that a person can breathe in it. This is to be done by letting a lighted candle slowly down, as where a candle will

burn, there a man can probably breathe; and, if the candle goes out, no one must venture down until the well be cleared, and the place at which the candle goes out will show the height to which the foul air reaches. This air is carbonic-acid gas, being the same as that which proceeds from burning charcoal, and from brewing-vats. Some soils make this more than others, especially a blue gualt.

This air, being heavier than the common air, sinks to the bottom, and must be drawn out, which may be effected by letting down a long tube or pipe, the upper end of which is to be closely attached to the valve underneath a pair of blacksmith's bellows, and then, by working the bellows, the air may be drawn out of the well.

Caution in the Use of Guns.—The following useful directions are extracted from *The Sporting Review*:—Never purchase or shoot with a gun that is not perfectly sound in all its parts, and especially in the inside of the barrels, and in the construction of the locks; and, whether new or second-hand, be well assured of its having been manufactured, *bonâ fide*, by a respectable gunmaker, and not merely got up for sale, with a deceptive exterior, and a pirated name upon it. Never suffer a gun, at any time, to be held for a moment, or even carried, so as to be likely to come in the direction of either man or beast. Never put your hand or arm upon the muzzle of a gun, nor lean over it. Never blow into the barrel of a gun, whether loaded or unloaded. Never use a gun for any other purpose than that for which it is obviously intended; and especially as a hammer, a mallet, a walking or a bush-beating stick; as a hook to draw the boughs of a thorn or tree towards you; as a staff to "bang dog," to lean upon, or to support yourself; to assist your fat friend up a bank, over or out of a ditch, or as a prop or leaping-pole, to help yourself over hedge or ditch; nor is there any occasion to take flying leaps with it in your hand, however anxious you may be to display your agility. *Never take a loaded gun into a house*, unless the caps or primers be first removed, and the tops of the nipples rubbed with a glove or handkerchief; the gun to be kept in your own hand, or immediately placed under lock and key.

Dangers of Window-Cleaning.—Many serious accidents are continually occurring to house-maids, engaged in the perilous employment of window-cleaning. The lives of workmen are likewise often in jeopardy, from the want of some secure apparatus for repairing windows, painting the frames, &c. In the list of patents for 1854, we observed that an invention was proposed for the prevention of accidents of this nature, relating to the portable stages usually employed by glaziers, painters, and others, to enable them to stand outside windows. The patentee

(Mr. F. Westbrook) constructs his stages as follows:—He provides a wooden or metallic frame covered with board, and furnished with two projecting legs, and two wooden or metallic screws of sufficient length to reach from the board or frame outside the sill to the interior of the apartment. Upon these screws two champs of wood or metal are placed, which may be either screwed to fit the screws, or loose upon them, and furnished with nuts. This arrangement allows the stage to be readily attached to any window-sill, whatever may be the thickness of the wall, or the projection of the sill beyond it.

Hints respecting Balconies.—When balconies are made of iron, it is an important precaution not to place the bars at such a distance that a child coming into the balcony can get its head between; since cases have occurred where children have put their heads out between the bars, and could not, by any means, draw them back again, and smiths have been obliged to file or saw the bars through before they could be extricated.

Public House Lamps.—A writer in the *Builder* cautions the District Boards against allowing heavy lamps to be projected over the footway, carried by *cast*-iron arms, faulty in construction, as cast-iron is a brittle material, liable to accident, breaking short off, as was the case with one I witnessed the other day, falling with a fearful crash.

If permitted at all, *wrought*-iron only should be allowed; the arms should be bracketed from below, or suspended, to prevent undue leverage.

Public house sign-boards should not be allowed.

Wound in the Hand from a Rusty Nail.—Wounds of the palms of the hands and soles of the feet generally cause anxiety to the surgeon, from the great risk of tetanus setting in. We have noticed many cases of the kind, in which the slightest scratch from a rusty nail on the foot, or perhaps the palmar aspect of the thumb, has ended fatally from this disease; yet there are many instances in which such an untoward event does not ensue.

Suffocation from Substances Sticking in the Throat.—If the substance have not descended low in the throat, it may often be hooked up by means of the finger. If lower, fasten a small piece of dry sponge, or tough meat, to a fine silk, or linen tape, and put it into the throat, holding the tape firmly in one hand. Let the patient then swallow a little warm milk, or water, so that the sponge or meat may pass into the gullet along with the fluid. As soon as this has taken place, withdraw the sponge by pulling the tape gradually, and it will most probably bring the substance along with it. Or a double wire may be made into a small blunt hook, with which the substance may often

be extracted. In some cases, where these remedies fail, an emetic is recommended, or if the patient cannot swallow, tickling his throat with a feather.

As, by this time, a medical man will probably have been procured, he will, in some extreme cases, make an opening for the purpose of extracting the substance; or in others, he will excite vomiting, by throwing some stimulating matter into the veins.

Lime in the Eye.—In relation to cases of workmen becoming blinded by the action of lime which has entered the eye, the *Indicateur de Mayence* recommends, as a well-approved application in the case of such accidents, a strong solution of sugar which is to be inserted, drop by drop, under the eye-lids. This application can be almost immediately obtained, and, it is said, will completely destroy the caustic application of the lime.

Stings of the Hornet and Wasp.—The stings of the hornet and wasp give rise, in many instances, to very acute pain, and very severe inflammation. The best application for the purpose of mitigating the effect of those stings is one composed of a drachm of powdered opium, rubbed down with one ounce of olive oil. Lay a little of this on a piece of lint on the wound, and repeat it occasionally.

Safety-hoist-governor for Mills, Warehouses, &c.—In consequence of the numerous accidents arising in mills, warehouses, &c., where it is necessary to remove goods from one floor or landing-place to another, by means of a hoist, the inventors of a safety-apparatus, called the "Safety-hoist-governor," Messrs. Westhead and Baines, ascertained, that in a majority of instances, the accidents arose from other causes than the breakage of the suspending rope or chain—namely, fracture of the driving-wheels, keys becoming loose, straps breaking, or the rope slipping on the pulley, when the cage was overweighted, or the removal of the break when the engine was standing. This showed the necessity of introducing a simple safety-apparatus, which should be brought into action whenever the velocity of the hoist, in its descent, attained a limit beyond which it would prove destructive to the machinery, and expose the persons employed to imminent peril.

The principle of this invention consists in making the velocity of the hoist its own governor or regulator. This is accomplished by a pair of governor-balls, similar to those ordinarily used in steam-engines, placed on the top of the hoist, which are put in motion by a friction-roller constantly pressing against the guide upon which the hoist works. Should the hoist ever attain a speed above that which it is originally regulated to travel at, the governor immediately releases a latch, and sets free a number of serrated cams, which are thrown out

against the guides, and instantly arrest the descent of the hoist.

This safety-hoist has already been the means of preventing serious accidents, particularly from the too great speed of descent of the hoist. In large warehouses hoists were liable to accident from being overloaded, by too many men getting on the hoist thoughtlessly, or putting on too heavy a load of goods, and several men getting on besides. This was one of the principal sources of acoident, the balance-weight being overpowered, and the motion unduly accelerated, so that the hoist ran down much sooner than was intended: but with the contrivance now mentioned, the moment this occurred, the governor-balls, flying out with an increase of velocity, lifted up the latch and stopped the descent of the hoist instantly by the powerful grip of the eccentric-cams jamming themselves against the guides.

Street Accidents.—It is supposed that nearly *one hundred persons* are yearly killed or injured in London by street accidents; to lessen their number, the following rules may be useful:—

Cross streets at regular crossings, but not at dangerous places, where four or more ways meet. Do not go before or behind a cab, or before omnibuses or stages, particularly if racing (Stat. 1, Geo. IV. c. 4). Beware of cabs or stages hovering near, they frequently start forward in a moment. Beware of side streets and gateways. Wait patiently till you can cross safely—then step with *firm, flat feet* (for the composition now used to cement paving oozes out and is very greasy, and mud itself is slippery). In case of *urgent necessity*, remember, if you push at a horse coming upon you, with your umbrella or stick, he will come forward, but if struck, he will shy; but remember, also, the poor brute *animal* is seldom to blame. If an accident happens, let the police and bystanders do their duty, watch the carriage and take the number or address (a *false* address was given in November last.) A policeman, with or even without a long stick, might clear the way at dangerous crossings at certain periods of the day. Might not a general police order be made for the protection of passengers in crossing, and for openings in lines of carriages, &c., and against furious driving of stages (Stat. 1, Geo. IV. c. 4), and furious riding?

> "Let constant vigilance thy footsteps guide,
> And wary circumspection guard thy side,
> Then shalt thou walk *unharmed*."—GAY'S "TRIVIA."

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